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RADIO & TELEVISION NEWS

MAY
1949

RADIO-ELECTRONIC
ENGINEERING
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WKY's FM-AM MOBILE UNIT

Page 53

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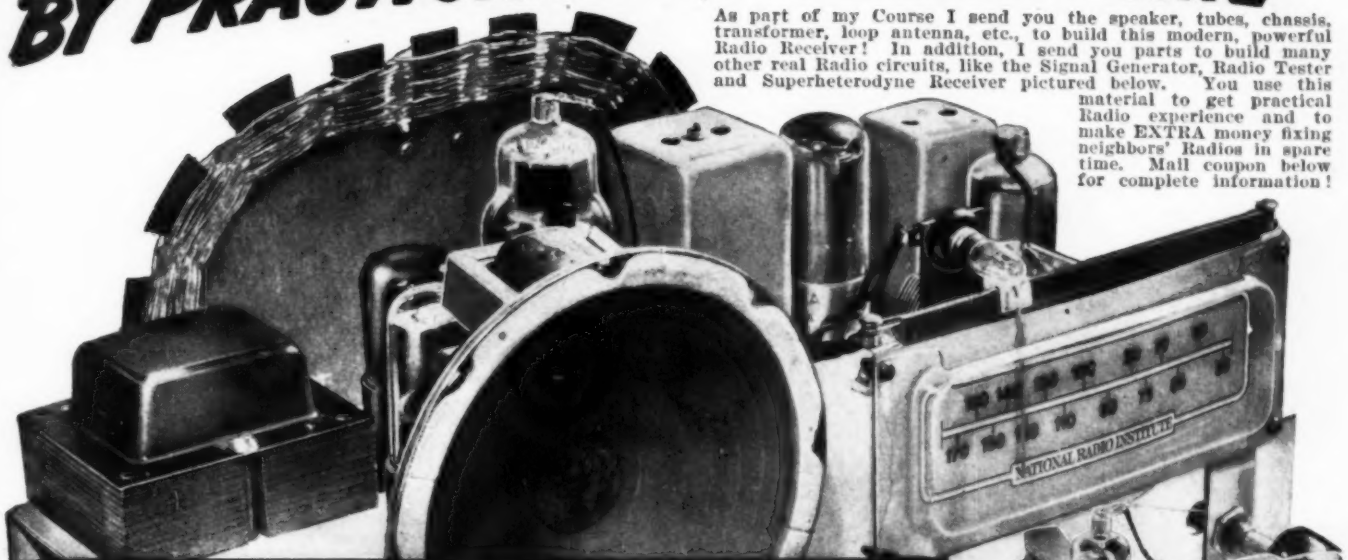
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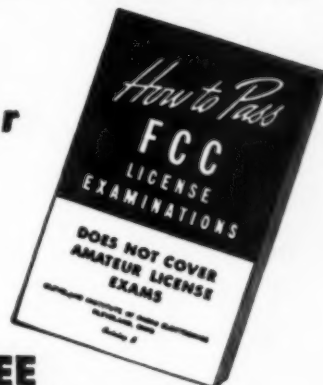
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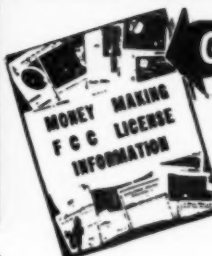
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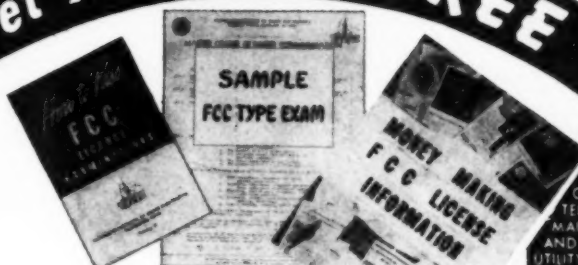
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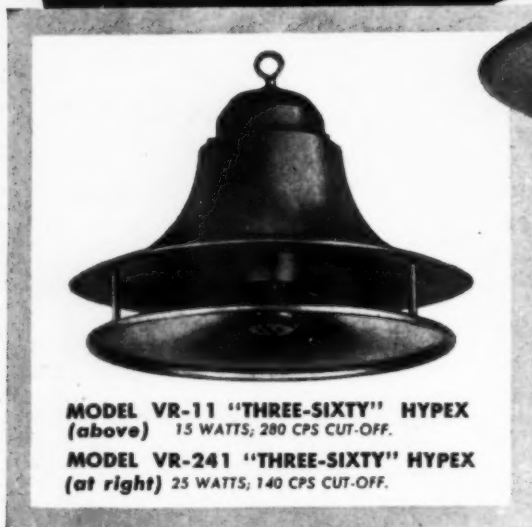
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For the **RECORD.**

BY THE EDITOR

HAM RADIO THREATENED BY NEW SERVICES

Utilities, Television, Citizens Radio
to Get New Frequencies

IF YOU, OM were to pick up a newspaper and read such a headline, you would be shocked as never before. You wouldn't believe that such a thing could ever happen to your hobby in a country of free speech and enterprise.

But it CAN happen unless you and I are willing to pitch in and do something about it. Strong words? We think not!

Let's quit kidding ourselves about the future security of our hobby. We, as hams, have always had a good "offensive" team. We have helped our country in times of stress, performed yeoman service when disaster came upon us and considered ourselves to be quite alert and aggressive in matters that are technical and communicative.

A strong offense is f.b.—but suppose the other teams have an equal or better offense. Someone's going to eventually lose his punch unless he is blessed with a good "defense."

Building a Defense

Amateur radio's defense depends upon its ability to train new hams and to make replacements as the going gets tougher. It needs the vitality of youth, as well as the wisdom of the coach, if it is to combat the increasing pressure brought to bear by new radio, television, and other services.

We have been told in Washington, for example, that unless we hams occupy and make use of our higher frequencies, they will be assigned to services having greater interest and need for their use.

If we believe that there is strength in numbers, then let's increase our strength by encouraging new hams to

join our team. It is the surest way to bolster our defense—in fact the **ONLY** way.

Too many of us hams are prone to "let George do it." We received a very discouraging report from a scoutmaster in one of our larger cities, telling how he approached the members of a ham club (about 200) for an instructor to teach an enthusiastic group of 50 scouts and 12 of their dads, who sincerely wanted to become hams. In spite of the incentive provided by our \$10,000.00 contest, not one amateur present even offered a suggestion—let alone a volunteer to take over 62 prospects who were ready and eager to start their course of instruction.

If this case is typical of the attitude of the American amateur, we hams had better look to our laurels and correct our thinking before it is too late!

Contest Extended to March, 1950

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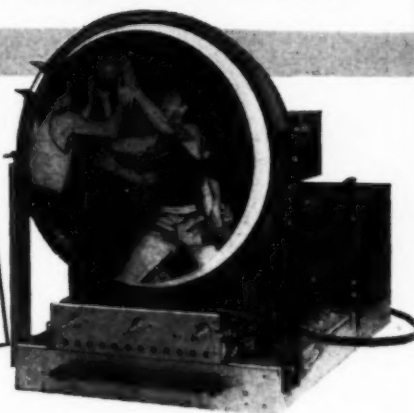
In addition, we are adding an alternate choice of U.S. Savings Bonds instead of amateur equipment to the winners, both individuals and clubs, of our \$10,000.00 contest.

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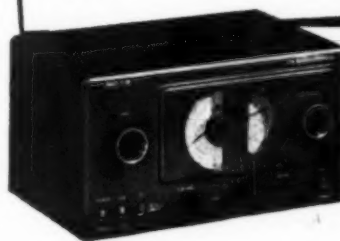
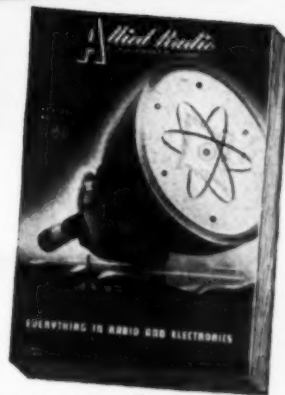
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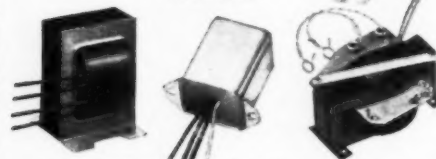


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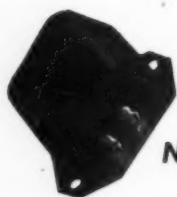
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A Complete Line
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Exclusive features like these make this the "Engineer's Line": Plate and filament voltages to fit today's most-used tubes; in two mountings—with solder lugs or 10" leads; one series for condenser input, another for reactor input use; exactly matching reactor for each power transformer. Get complete catalog now.



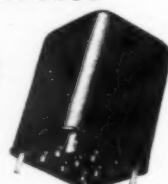
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Two efficient filter reactors, inductance values .8 and 2.4 henrys respectively, are designed for noise suppression circuits, but can be used in any tuned circuit requiring the given inductances. Inductance values are accurate within $\pm 5\%$ with up to 15 ma. d-c. Minimum Q of 20. Mounted in identical drawn steel cases $1\frac{1}{16}" \times 2\frac{3}{8}" \times 1\frac{1}{16}"$. Write for descriptive sheet including diagram of simplified dynamic circuit.

FULL FREQUENCY RANGE AUDIO TRANSFORMERS

within $\pm \frac{1}{2}$ db.
typical response
30 to 15,000 cycles



For uniformly low distortion, for response curves that are truly flat over the full frequency range, use these CHICAGO input and output units. Get the facts on the BO-6 (P-P 6L6's to 6/8 or 16/20-ohm speaker), the BO-7 (600/150-ohm line to 6/8 or 16/20-ohm speaker), and other CHICAGO full frequency units—they're tops in transformers.



ISOLATION TRANSFORMERS

for safer,
more efficient
servicing

For isolating chassis ground from line ground and eliminating the shock hazard (important on "hot" TV sets). Dual purpose: where line is under/over voltage, sec. supplies 115 v.; with 115-volt line, sec. supplies 125/115/105 volts (high/low volts help find doubtful tube, etc.). Three sizes: 50, 150, or 250-VA. to cover full range of servicing needs.



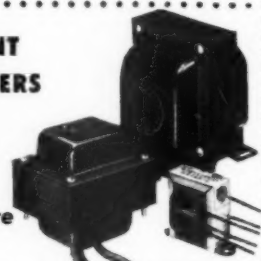
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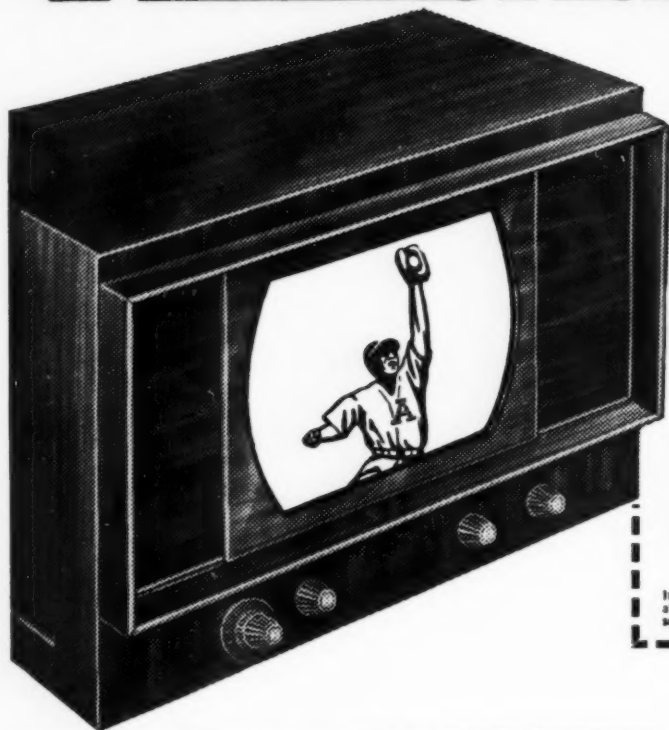
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This high-quality Transvision TV Kit has a **15" picture tube**. In all other respects it is the same as the 12A shown above.

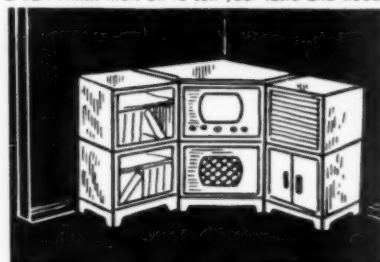
\$299 Less Cabinet

***CHOICE of BEAUTIFUL CABINETS from \$29**

For example, a "Modular" Console Cabinet which can be easily assembled in about an hour, costs \$29.

ASSEMBLE Your Own CABINETS

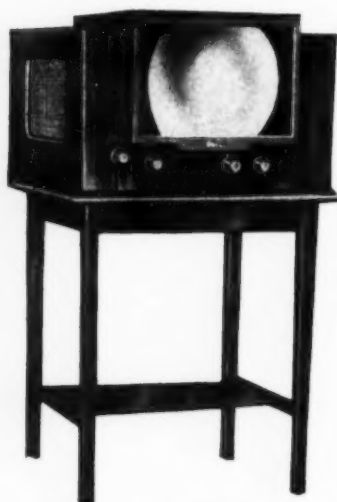
Transvision's "MODULAR" Cabinets come in knock-down, unpainted units, offering an unlimited range of combinations, including even a bar. Finish them off to suit your taste and need.



Corner piece, shown above, has room for TV, Phono, Record Storage, and open Book Case. **COMPLETE \$84.00**
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200 Sq. In. PICTURE

TV-FM KIT

MODEL 12CL

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IMAGE IS EQUAL to that of a 20" tube—even sharper and clearer—visible from all angles.

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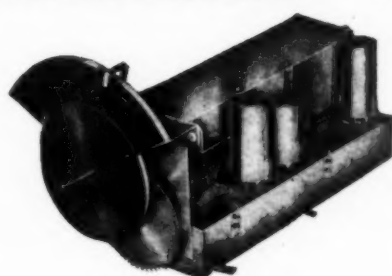


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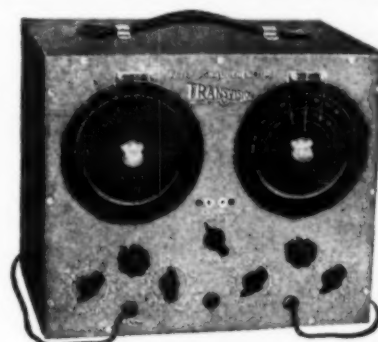
RM-5

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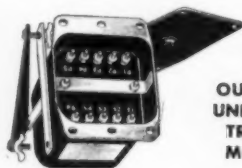
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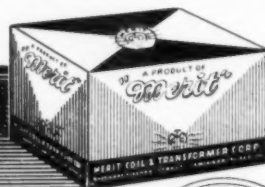
Type No.	List Price	Ohms Impedance	
		Primary	Sec.
A-4043	\$ 8.75	250-500-1000-1500-2000	4-8-16
A-4041	9.75	250-500-1000-1500-2000	4-8-16
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A-4043	9.75	45-50	4-8

Type No.	Watts	Mounting Center Case	Dimensions		
			H	W	D
A-4043	8	2 1/4 x 3 7/8	4 1/4	4 7/16	3 9/16
A-4041	12	2 1/4 x 3 7/8	4 1/4	4 7/16	3 9/16
A-4042	25	2 1/4 x 3 7/8	4 1/4	4 7/16	3 9/16
A-4043	12	2 1/4 x 3 7/8	4 1/4	4 7/16	3 9/16

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By RADIO & TELEVISION NEWS
WASHINGTON EDITOR

WASHINGTON, once again, has become a technological arena with the very-high and ultra-high TV bands as the featured performers.

Since December, when the famous propagation hearings were held and the subsequent Ad Hoc committee was formed to resolve the divergencies of opinion, industry and government experts have been sparring and marking time until all the possible variables in the allocation problem could be evaluated and a decision formulated. The volumes of statistical information which had to be studied made it difficult to arrive at an immediate satisfactory conclusion, and as a result, armchair specialists became busy and began to arrive at diverse opinions, which were far from complimentary not only to the government bodies but those from industry who were striving to solve an extremely difficult situation, all of which tended to alarm Mr. and Mrs. Public.

Actually the committee has reached a statistical approach, which involves relating the median tropospheric fields to the 4/3 earth's radius value up to distances of about 90 miles. At larger distances, where but few measurements are available and where the median value is in general below the recorder noise level, a single curve was developed which provided the best fit to the measured levels of intensities for one per-cent of the time, irrespective of the frequency and of the height of the transmitting antenna. Measured ratios of the one per-cent and ten per-cent levels, which showed systematic frequency effects, were applied to the one per-cent curve to produce curves of the levels exceeded for ten per-cent of the time for a sequence of frequencies. Families of curves for several antenna heights and frequencies, showing the continuous variation with distance of the field intensities to be expected for various percentages of the time, were produced by a system of smooth transition between the distance ranges involved in the foregoing two approaches.

Now these data are being probed for application to the present standards. The information at this stage has been conclusive enough for FCC Chairman Wayne Coy to state, and most emphatically, that the existing very-high channels will be available for a long, long time, the freeze will be undoubt-

edly lifted during the first weeks of the summer and some ultra-high stations will probably be operating in the early months of next year. The ultra-high stations, operating on the same channels, are expected to be about 200 to 225 miles apart, Coy stated.

Senator Edwin C. Johnson of Colorado, chairman of the Interstate Commerce Committee and father of the 50-kilowatt AM bill now being debated in Congress, entered the ultra-high battle by writing a letter to FCC Chairman Coy asking that the Commission and the TV industry take steps to protect the public against depreciation of their investments in television receivers when the higher frequencies come into use. As a result of this correspondence, one manufacturer decided to enter the dispute and indicate in advertisements, which appeared nationally, that his equipment could accommodate the higher bands without major alterations. Others in the industry voiced the opinions that present channels will not be obsolete, basing their remarks on FCC Chairman Coy's assurances, and, therefore, the sets now being sold will continue to receive all stations now on the air or soon to be authorized. These manufacturers also emphasized that conversion of most current receivers for the ultra-highs would offer no particularly difficult technical problems and in most cases will not prove prohibitively expensive, as several in Washington and industry indicated.

Two schools of thought did enter into the experienced experts' probe as to the immediate and future use of the ultra-high bands. In one set of views, expressed at the recent IRE national meeting at the Hotel Commodore in New York City, David B. Smith, vice president in charge of research and engineering at Philco, said that the ultra-highs are unlikely for several years and when they do come will not obsolete present TV receivers. Smith based his conclusions on an investigation made by Joseph Fisher of the Philco research division, who presented his report at the IRE meeting. According to the Fisher tests, which were made at sixty locations in the area of Washington, at distances of from one-and-a-half to twenty-three miles from the NBC experimental transmitter in the Wardman Park Hotel operating in the 504 to 510-mega-

RADIO & TELEVISION NEWS



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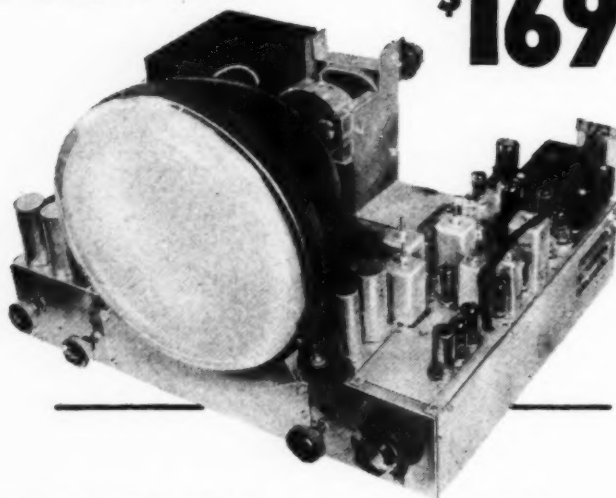
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cycle channel, power requirements in the ultra-highs will have to be much higher than on the lower channels to achieve comparable coverage, probably four to five times more powerful. It was also found that the shadowing effect caused by obstructions such as hills, buildings, and trees is much greater in the higher bands, thus requiring added height for the antenna system. The report then went on to reveal that at least three years or longer would be required before transmitters with the required high powers could be built.

According to Fisher it was found possible to receive satisfactory signals on the ultra-highs with a simple three-tube converter and a standard television model. During the tests three types of receiving antennas were used and mounted on a station wagon. These were a half-wave dipole, four-element Yagi and eight-element array with a screen reflector, each of which at one time or another was extended to a height of thirty-five feet. The antennas were connected to the input of the converter by means of a double shielded 93-ohm coaxial transmission line. The converter used a tuned coaxial input circuit feeding into a 1N21C crystal. The i.f. frequency of the converter was 54 to 60 megacycles.

In addition to the 500-megacycle tests in Washington, propagation measurements were made in the Philadelphia area, using a 20-kilowatt, 3300-megacycle one-microsecond pulse transmitter with a directional transmitting antenna.

In a contrary opinion and IRE report, Dr. Thomas T. Goldsmith, director of research for *Du Mont*, declared that ultra-high transmitters could be made available probably within a year. Goldsmith did agree with Fisher and Smith as to the successful use of converters and the fact that obsolescence of the present receivers would not be a factor, when the ultra-highs were authorized.

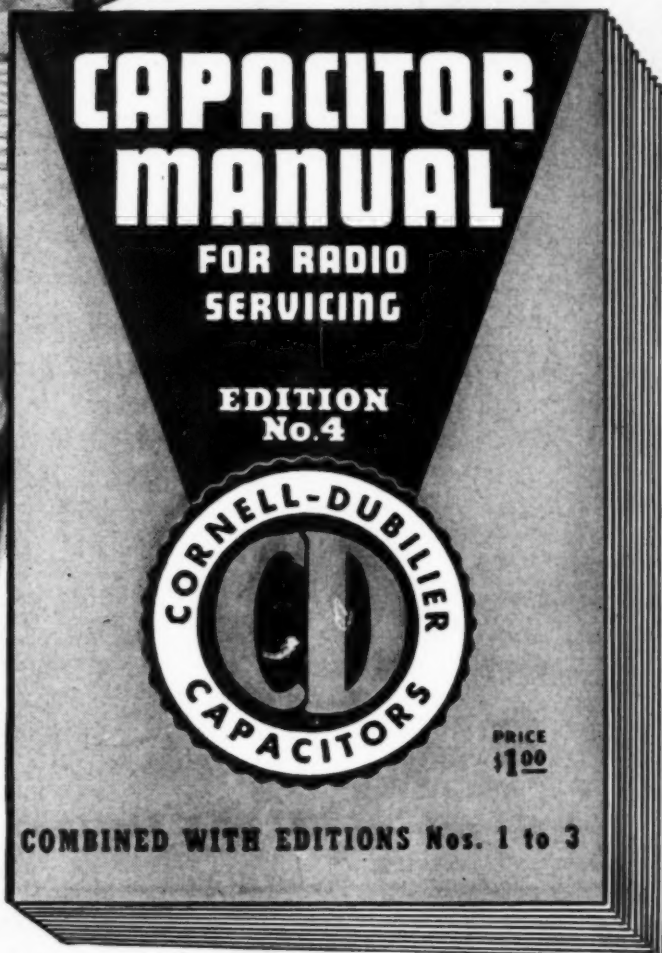
The implication that the ultra-highs may not be too far in the offing was also expressed in an *RCA* engineering report, which revealed the development of a method of combining transmitting tubes in groups or clusters, which could materially increase the power of television stations operating anywhere from 300 to 3000 megacycles. Describing the method at the IRE meeting, G. H. Brown, W. C. Morrison, W. L. Behrend and J. G. Reddick of the *RCA* labs, said that two tubes, or two complete transmitters, are teamed through a special network called a duplexer, which permits the combined outputs of the tubes to be fed into the same antenna, thereby doubling the effective power output, without narrowing the width of the band transmitter. It was stated that a transmitter with four output stages, combined with three duplexers, had been built. With the four stages operating at 850 megacycles, the final output of the transmitter was found to be four times the power obtained from a single

(Continued on page 152)



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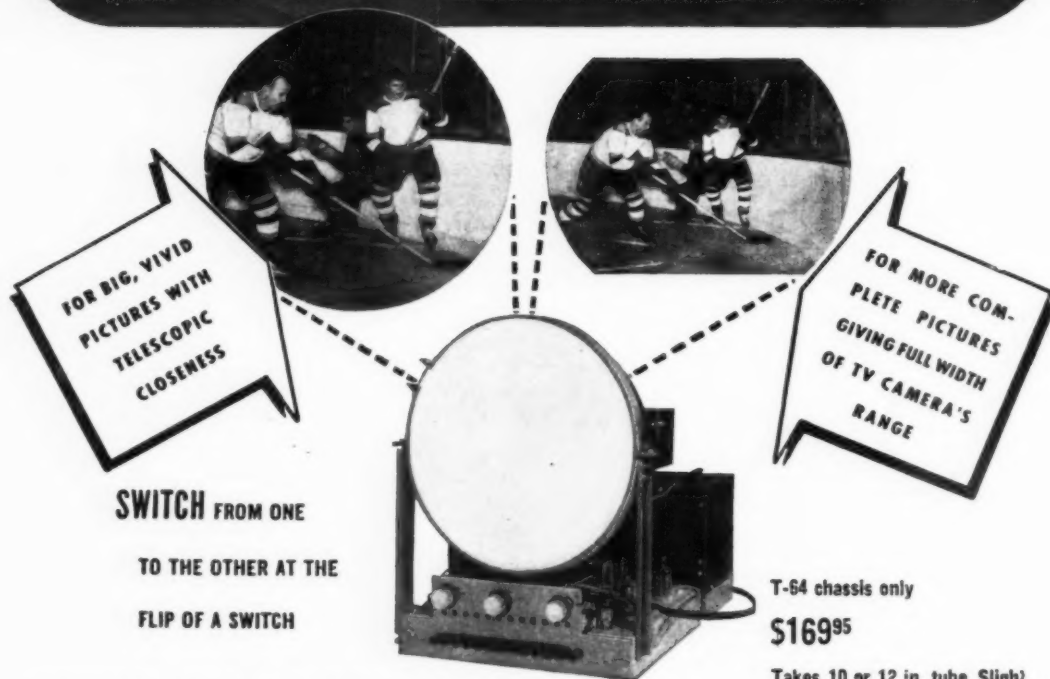
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Applies for—and GETS—a good pay, full time job in industry. Finds that employers know National Schools and like to hire their graduates.



Or he opens own profitable Service Shop, with valuable counsel and aid from National Schools. Now for real happiness and success!



You Build This Superheterodyne Receiver With Parts We Send

You receive complete standard equipment, including latest type High-Mu Tubes, for building various experimental and test units. You progress step by step until you build a complete Superheterodyne Receiver. It is yours to use and keep.

Professional Multitester Included!

This portable instrument (see right) enables you to perform many practical tests, make delicate adjustments and do service work. Complete with test leads.

You receive a series of special laboratory experiment lessons to guide your practical exercises with your equipment. These lessons have been prepared with a special technique of illustrating radio principles by numerous easy-to-understand examples.

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YOU BE THE JUDGE!

➡ See for yourself why BC "Hi-Kap" Capacitors, feature for feature . . . are your best buy for **QUALITY!**

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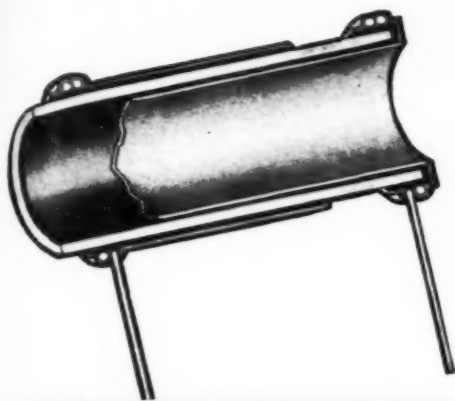


◀ SEE
THIS DISPLAY
AT YOUR
CENTRALAB
DISTRIBUTOR

SEE THESE
"HI-KAP" VALUES
AND PRICES ➡

PART NUMBER	VALUE (MFD)	LIST PRICE*
D6-100	.00001	\$1.25*
D6-150	.000015	1.25*
D6-250	.000025	1.25*
D6-400	.00004	1.25*
D6-500	.00005	1.25*
D6-101	.0001	1.25*
D6-151	.00015	1.25*
D6-201	.0002	1.25*
D6-251	.00025	1.25*
D6-301	.0003	1.25*
D6-401	.0004	1.25*
D6-501	.0005	1.25*
D6-751	.00075	1.25*
D6-102	.001	1.25*
D6-152	.0015	1.25*
D6-202	.002	1.25*
D6-252	.0025	1.25*
D6-502	.005	1.50*
D6-752	.0075	1.50*
D6-103	.01	1.50*

*Per Envelope of 5
Rating: 600 WVDC — 1000 V. flash tested. Individually color coded, inspected and insulated.



➡ *Never before has the dependability, permanence and convenience of ceramic by-pass and coupling capacitors been offered to Radio Service Dealers at a favorable price!*

"HI-KAP" FEATURES	DESCRIPTION			ADVANTAGES
1. Impervious to moisture	Ceramic-X is non-hygroscopic. Moisture absorption is .007% or less.			No deterioration, no shorting. Longer life even under the most adverse conditions.
2. Low mass weight	Av. Wt.	Dimensions	Values	For unit size and weight, Centralab BC "Hi-Kaps", made with Ceramic-X, are the only capacitors on the market which provide these voltage ratings.
	.029 oz.	D—.315" L—.540"	.00005— .00025 mfd.	
3. Small size	.044 oz.	D—.315" L—.830"	.0005 mfd.	
	.050 oz.	D—.340" L—1"	.000750— .005 mfd.	
4. High capacity	.082 oz.	D—.400" L—1.305"	.01 mfd.	
	Rating: 600 WVDC — 1000 VDC flash test.			
5. Special insulation	Wax impregnated, lacquered, dipped in special phenolic resin, cured and wax impregnated.			Prevents any possibility of shorting to adjacent leads, chassis or components.
6. Convenient side leads	Heavy #22 gauge tinned copper.			Permit rapid, close-coupled connections. No tricky bending or fitting required.
7. Low power factor	Initial — .6%. After 100 hours, 95% humidity test — 3.0%.			More efficient circuit operation, fewer failures.
8. High leakage resistance	Initial — 5000 megohms. After humidity — 500 megohms.			Long life, more efficient performance.
9. Maximum dependability	One-piece construction. Leads soldered directly to electrodes.			Will not short or become intermittent.
10. Factory tested	For your protection, all units 100% factory tested before packaging and shipping.			Your guarantee to your customers of reliable service and performance.

➡ *See your Centralab Distributor for complete information on this new line of ceramic by-pass and coupling capacitors, or write direct to*

Centralab

DIVISION OF GLOBE-UNION INC., MILWAUKEE, WIS.

Announcing 2 SENSATIONAL NEW INDOOR ANTENNAS by **WARD**

WARDS NEW TVI-49

Ward's portable TVI-49 will give excellent reception on all channels—orients easily in all directions. Chrome plated brass dipoles. The TVI-49 is sturdily constructed and weighted perfectly—it will not tip over—
List \$6.95



WARDS NEW TVI-43

The TVI-43 brings in all channels precisely and brilliantly. Most attractive — chrome plated brass telescopic dipoles, satin beige brown finish—blends perfectly with the most exacting interior.
List \$17.95

See any leading parts distributors or write for catalog today.



WARD PRODUCTS CORPORATION
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DIVISION OF THE GABRIEL CO.

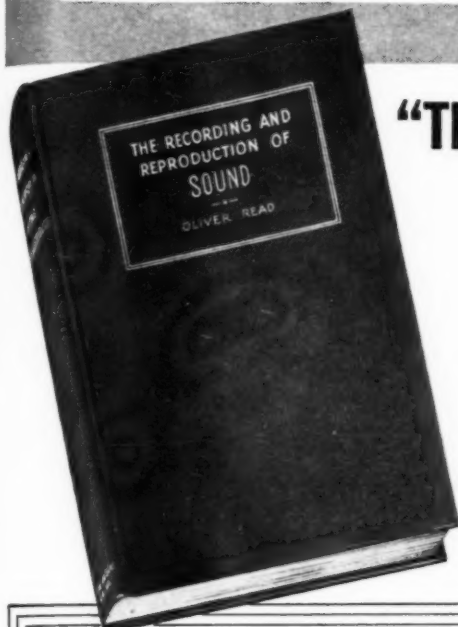
TELEVISION SET SHIPMENTS BY AREAS

Television Broadcast Service Area	Accumulative (1947 & 1948)	Television Broadcast Service Area	Accumulative (1947 & 1948)
ALABAMA		Paterson	1,864
Birmingham	23	Runnemed	13
ARKANSAS		Trenton	5,101
Little Rock	19	Newark-Trenton	2,153
Other Cities	42	Cities not stated	6,579
CALIFORNIA		Other Cities	5,128
Fresno	11	NEW MEXICO	
Los Angeles	75,250	Albuquerque	248
Long Beach	554	NEW YORK	
Oakland	60	Albany	11,933
Santa Barbara	201	Binghamton	33
San Diego	536	Buffalo	8,687
San Francisco	11,665	Long Island	9,986
Other Cities	1,157	Middletown	153
COLORADO		Newburgh	34
Denver	37	New Rochelle	110
CONNECTICUT		New York City	256,873
Bridgeport	2,039	Poughkeepsie	813
Hartford	11,492	Rochester	65
New Britain	144	Schenectady	491
New Haven	2,012	Syracuse	1,734
Waterbury	117	Tarrytown	33
Other Cities	688	Utica	66
Cities not stated	580	Westchester	1,486
DELAWARE		Other Cities	683
Wilmington	2,724	Cities not stated	729
Other Cities	7	NORTH CAROLINA	
DISTRICT OF COLUMBIA	30,338	Charlotte	219
FLORIDA		Other Cities	12
Miami	789	NORTH DAKOTA	
Tampa	44	OHIO	
Cities not stated	54	Akron	1,565
GEORGIA		Canton	186
Atlanta	4,455	Cincinnati	9,617
Other Cities	376	Cleveland	19,462
ILLINOIS		Columbus	22
Chicago	72,345	Dayton	1,763
Moline	26	Toledo	5,349
Peoria	365	Youngstown	142
Rockford	82	Other Cities	843
Rock Island	20	OKLAHOMA	
Sterling	37	Oklahoma City	18
Tuscola	16	Other Cities	10
Other Cities	733	OREGON	
INDIANA		Portland	125
Gary	2,261	Other Cities	9
Fort Wayne	47	PENNSYLVANIA	
Hammond	214	Allentown	2,147
Indianapolis	423	Easton	46
South Bend	1,429	Erie	303
Cities not stated	160	Harrisburg	201
Other Cities	206	Hazeltine	103
IOWA		Lancaster	285
Madison	42	Philadelphia	98,369
Other Cities	6	Pittsburgh	5,652
KANSAS		Pottsville	144
KENTUCKY		Reading	1,449
Louisville	2,897	Sunbury	119
Other Cities	57	Williamsport	31
Cities not stated	165	Other Cities	838
LOUISIANA		RHODE ISLAND	
New Orleans	3,970	Providence	3,266
Other Cities	13	Other Cities	1,115
MAINE		TENNESSEE	
MARYLAND		Chattanooga	15
Baltimore	27,885	Knoxville	19
Other Cities	375	Memphis	3,057
MASSACHUSETTS		Nashville	40
Boston	29,095	Other Cities	30
Cambridge	3,797	TEXAS	
Springfield	159	Dallas	3,982
Taunton	48	El Paso	163
Worcester	994	Fort Worth	2,093
Other Cities	265	Houston	2,047
Cities not stated	321	Other Cities	249
MICHIGAN		Cities not stated	175
Detroit	25,942	UTAH	
Grand Rapids	148	Salt Lake City	977
Pontiac	24	Cities not stated	24
Other Cities	222	VERMONT	
MINNESOTA		VIRGINIA	
Minneapolis-St. Paul	6,223	Alexandria	15
Other Cities	13	Norfolk	286
MISSISSIPPI		Richmond	2,946
MISSOURI		Other Cities	173
Kansas City	502	WASHINGTON	
St. Louis	15,849	Seattle	4,450
Other Cities	76	Tacoma	47
NEBRASKA		Other Cities	72
NEW HAMPSHIRE		WEST VIRGINIA	
Manchester	309	Clarksburg	41
Other Cities	48	Wheeling	87
NEW JERSEY		Other Cities	29
Atlantic City	1,109	WISCONSIN	
Camden	11	Madison	98
Irvington	587	Milwaukee	12,859
Jersey City	286	Other Cities	80
Newark	87,459	AREAS NOT DETERMINED	29,037
New Brunswick	21	TOTAL SHIPMENTS	964,206

(Editor's Note: The figures herein are presented through the courtesy of the Radio Manufacturers' Association (RMA). In view of the fact that not all television set manufacturers are members of RMA, add approximately 10 percent to all of the figures above. Admiral Radio Corporation for one, and all kit manufacturers, do not belong to RMA, and their production of sets accounts for at least 10 per-cent additional.)

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"The Recording and Reproduction of SOUND"

The first complete reference book that gives
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Have the Answers to Questions Like These

Do you know how to select the proper recorder for your purposes? Do you know how to get the most out of your recorder? Can you select the proper amplifier for a given application? Want to know how to test amplifier performance? Which to use—crystal or magnetic pickup? Do you know how to utilize inverse feedback, expanders and compressors? The answers to these and hundreds of other vital questions are given authoritatively by Oliver Read. His easy-to-understand treatment takes the mystery out of the subject; his facts are based largely on actual laboratory experience. No other single volume brings you this vast wealth of reliable information. This book belongs in your library!

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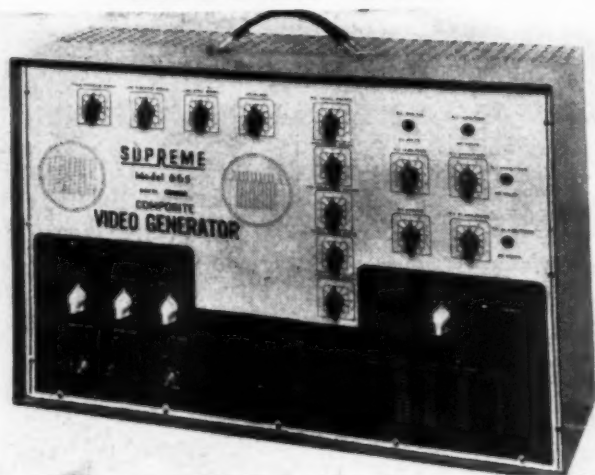
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MODEL 665



COMPOSITE VIDEO GENERATOR

- INSTALLATION AND REPAIR WITHOUT STATION TEST PATTERN OPERATION.
- PROVIDES COMPLETE COMPOSITE VIDEO SIGNAL.
- PROVIDES BOTH HORIZONTAL AND VERTICAL SYNC AND BLANKING PULSES—SAME AS TV STATION OPERATION.
- PROVIDES DOT MODULATION FOR ADJUSTMENT OF HORIZONTAL AND VERTICAL LINEARITY AND HOLD CIRCUITS—ADJUSTMENT OF DEFLECTION YOKE AND FOCUS COILS.

MODEL 660



TELEVISION OSCILLOSCOPE

- EXTRA SENSITIVE AMPLIFIERS. FIVE TIMES AVERAGE SENSITIVITY.
- WIDE BAND AMPLIFIERS. 10 CYCLE TO 5 MEGACYCLES.
- Z AXIS AMPLIFIER. PROVIDES AMPLE SIGNAL FOR GRID MODULATION OF CATHODE RAY TUBE.
- WIDE RANGE SWEEP GENERATOR FOR TIME BASE. UP TO 150,000 CYCLES.

The Model 665 Composite Video Generator and the Model 660 Television Oscilloscope provide a pair of testers whereby "Signal Tracing" in television sync separation, sweep circuits, and video amplifiers can be made without frequency distortion. SEE THIS NEW TEST SYSTEM.

ANOTHER 1ST!
BY SUPREME

SUPREME
INCORPORATED

You'll Satisfy More Customers With



Flat Cell "B" Batteries . . .

The Only Radio Batteries Whose Cells Are

INTERLOCKED

LOOK WHAT IT MEANS

Each cell holds more power-producing chemicals with no waste space.

Triple sealing, under fixed pressure, insures against power leakage.

Up to 91% fewer soldered connections greatly reduce battery "hum" or failure—give longer life.

We guarantee these . . . the ONLY radio batteries with INTERLOCKED flat cells . . . to give more listening hours, and clearer reception under normal conditions.

IT'S
EXCLUSIVE
WITH
OLIN!



SEE HOW IT'S DONE

Note in the magnified view showing the enlarged cut-away section how each cell is INTERLOCKED . . . Patented U. S. Pat. No. 2416576.



CHECK THE PRINCIPLE

Interlock your fingers. Then even a strong man would have difficulty pulling your hands apart. This is simple proof of the power of *interlocking* . . . the same principle which is used to make OLIN "B" flat cell batteries the strongest and therefore the longest lasting radio batteries . . . the ONLY batteries that have triple-sealed, equally-strong INTERLOCKED flat cells instead of cells bound together with paper tapes or the other type wrappings found in ordinary batteries.



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PYRAMID
ELECTROLYTICS

for
Top performance
at **85c**



Pyramid Type 85TM Capacitors
are now in volume production
for leading TV-receiver
manufacturers throughout the
U.S.A. and Canada.



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CAPACITORS

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Within the INDUSTRY

HOFFMAN RADIO CORPORATION, during a luncheon meeting held recently in its main plant, honored Max Balcom, president of the Radio Manufacturers Association. Some 32 members of the West Coast Electronic Manufacturers Association were in attendance.

Mr. Balcom, also vice-president of *Sylvania Electric Products, Inc.*, was welcomed by H. Leslie Hoffman, president of *Hoffman Radio*. Principal speaker at the luncheon, the RMA head expressed confidence regarding the growing future of the television industry, with particular emphasis on the West Coast TV picture. He stressed the fact that television must be sold for what it really is—a medium of entertainment for bringing home and family together. He also stated that the East needs the cross-continent coaxial cable link as much as the West, as it will make available outstanding Western talent.

The meeting closed with a get-together of the Electronics group, founded by Mr. Hoffman, its first president.

JOHN HOLLISTER POTTS of New York City, president of *Radio Magazines, Inc.*, died March 16, at the age of 56.

Mr. Potts was a descendant of John Potts, founder of Pottstown, Pa. He was born in Chicago and graduated from the University of Chicago, with a degree in electrical engineering. During his career, he worked with the *Radio Corporation of America*, the *Sperry Gyroscope Company*, and other firms in engineering capacities. He also served *John F. Rider Publishers, Inc.*, and was technical editor of *RADIO NEWS*.

CHARLES K. HOOPER is the new advisory engineer for the Electronics and x-ray division of the *Westinghouse Electric Corporation*, Baltimore, Maryland.



A graduate of the University of Maine, Mr. Hooper has been associated with *Westinghouse* for the past sixteen years, where he was concerned with the design and application of motors, generators, and other forms of rotating electric power equipment. More recently he has been engaged in the application and design of power supplies and controls for use in the electronics industry.

REMINGTON RADIO CORPORATION, White Plains, New York, has acquired

an additional 16,000 square feet of space to further its plans to substantially increase present production.

The space is located in White Plains, in a building apart from the present operations and will serve the company by providing more room for the cabinet department. One section, however, will be turned over to assembly.

The *Remington Radio Corporation* is the manufacturer of Rembrandt Television receivers.

ROBERT D. ESSIG, a graduate of the University of Michigan, is currently an engineer in the Broadcast Engineering Department of the *Collins Radio Company*.



Mr. Essig joined the *Collins* organization in 1947 following a period when he was an engineer for the University of Michigan Broadcasting Service. Prior to that he had served as assistant technical supervisor for the American Forces Network of broadcast stations while with the occupation forces in Germany.

An associate member of the IRE, Mr. Essig is also a member of the Armed Forces Communications Association, and a 1st Lieutenant in the Signal Corps Reserve.

JOHN B. WALT, who has been in sales promotion work in the Chicago area since 1937, has been appointed assistant advertising manager of *Admiral Corporation*, it was announced by the advertising director, **SEYMOUR MINTZ**.

DORMAN D. ISRAEL, executive vice-president of *Emerson Radio & Phonograph Corporation*, was made a Fellow of the American Institute of Electrical Engineers, at a recent meeting of the engineering organization. *Fredrick Hart & Company, Inc.*, manufacturer of electronics equipment, has acquired a new vice-president in the election of **JAMES F. BREHM** to that office. At a meeting held in February, the board of directors of *Lear, Incorporated*, elected **D. W. HAVEN** as treasurer; at present, Mr. **HAVEN** is comptroller and will retain his duties in that capacity. The appointment of **W. WESLEY BALLARD** to the post of director of publicity and advertising, communications division, has been announced by *Motorola, Inc.* The new assistant advertising manager of the *Philco Corporation* is **EDWARD B. BAILEY**, who will serve as executive assistant to **JOHN F. GILLIGAN**, advertising manager. **WILLIAM E. NEILL** will be the sales engineer of the television

RADIO & TELEVISION NEWS

IN A RADIO SET

*how small
can you get?*

Sylvania's four tiny new tubes hold the answer

The miniature radio set shown here is an example of what can be done through the use of Sylvania's new subminiature tubes.

These specially designed and engineered T-3 subminiatures are battery-type receiving tubes perfect for very small radios or amplifiers. Short tube leads provided in conventional pin arrangement permit these tubes to be plugged into appropriate subminiature sockets. They can be operated over a wide range of battery voltages. Low current requirements result in battery economy.

Send for complete ratings and characteristics.
Sylvania Electric Products Inc., Advertising
Dept., R-1005, 500 Fifth Ave., New York 18, N. Y.



Type 1T6
(diode
pentode)



Type 1E8
(converter)



Type 1AC5
(output
pentode)



Type 1AD5
(RF pentode)

Four new Sylvania subminiatures shown in place in tiny radio set. Note size in relation to pencil.

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RADIO TUBES; CATHODE RAY TUBES; ELECTRONIC DEVICES; FLUORESCENT LAMPS, FIXTURES, WIRING DEVICES, SIGN TUBING; LIGHT BULBS; PHOTOLAMPS

May, 1949

27

the ultimate
IN DELUXE PERFORMANCE
with ESPEY
AUDIO AMPLIFIER
POWER SUPPLY
DE LUXE TUNER

MODEL 514 AMPLIFIER
MODEL 513 TUNER

NEW!
CUSTOM BUILT
AM-FM Quality CHASSIS

Here is exquisite high fidelity in chassis form that will grace the finest cabinet.

The 513 De Luxe Tuner is easy to install in any console cabinet, old or new and embodies the latest engineering refinements for lasting high quality at a price that defies competition.

The Espey 513 Tuner employs 10 tubes plus tuning indicator in a super heterodyne circuit and features a drift compensated circuit for high frequency stability, tuned RF on AM and FM plus phono input provision, and separate AM and FM antennas.

Model 514 De Luxe Power Supply-Audio Amplifier is designed specifically to work in conjunction with Model 513 Tuner, and is also used wherever a high quality audio amplifier is required.

With an output of 25 watts, Model 514 features a parallel push pull output circuit, self balance phase inverter system, extended range high fidelity response, and inverse feedback circuit.

Write Dept. KD for your free catalog.

ESPEY Makers of fine radios since 1928.
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and microwave engineering department of Raytheon Manufacturing Company, Waltham, Mass., bringing sixteen years' experience in radio broadcasting and VHF radio communications to that capacity. Technical Appliance Corporation, manufacturers of Taco radio and TV antennas, has announced that its new chief engineer will be **KENDRICK H. LIPPITT**, formerly associated with George C. Davis, broadcast radio consultant in Washington, D. C.

RALPH V. LITTLE, JR., is presently supervisor of RCA's Theater Television Engineering Group and is now active in the development of theater TV equipment by the direct projection and intermediate film processes and the development of equipment for making television recordings on 16 mm. film.

Mr. Little, a graduate of Pennsylvania State College with a degree of Electrical Engineering, joined RCA in 1933 and was assigned to the testing of transmitter and television equipment. He was transferred to the Television Engineering staff in 1939, and while with this group contributed to the development of portable television equipment.

CHET JORDON and **MAX LIEBMAN** have been appointed district sales managers in the respective territories of lower Manhattan and Queens County, New York, to handle the Air King line of radio and television receivers. **WALTER T. MORELAND** will succeed **WILLIAM E. SKINNER** as Arvin district manager for Texas and the southwest territory, following Mr. Skinner's appointment as manager of Arvin Distributors, the company's new factory branch operation in Chicago. **ROWLAND R. GUILDFORD** is the new assistant sales manager of the Allen B. Du Mont Laboratories, Inc., television receiver division, and will work closely with **VICTOR E. OLSON**, sales manager, in the direction of Du Mont receiver sales policies. Garod Electronics Corporation announces the following territorial distributors for its line of "Tele-Zoom" receivers: **GENERAL DISTRIBUTORS**, Wheeling, West Virginia; **THE HARGIS COMPANY**, Austin, Texas; **MONITOR DISTRIBUTING CO.**, East Providence, R. I.; **SILK-WORTH DISTRIBUTORS, INC.**, Ypsilanti, Michigan; and **W. E. TITUS WHOLESALE CO.**, Oklahoma City 2, Oklahoma. Recent Emerson Radio & Phonograph Corporation appointments include **STANLEY M. ABRAMS** as the new sales manager of the television division, **HAROLD E. KARLSRUHER** as head of the home radio division, **ARTHUR N. GROSSBERG**, assistant sales promotion manager, and **GERALD LIGHT** as assistant to the vice-president in charge of sales.

**HI-MU TRIODE 100TH AMPLIFIER
OSCILLATOR MODULATOR**

Made by nationally known mfr. Can't reveal mfr's name, you know it. Each tube is BRAND NEW. R.M.A. GUARANTEE, individually boxed.

\$7.95 each Two for **\$15.50**

Please send check or M.O. with order.
Add postage.

Please! Due to this terrific low price, we cannot afford the extra handling. No C.O.D.'s.

If you are a user of this tube, believe me, this is a real buy. Put them away for future use—it's like money in the bank! With our personal guarantee.

XTALS 500 KC STANDARDS
2 pin mount, brand new. Price, each \$1.50

McCONNELL'S

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"Madame X" was the code name, during research and development, for an entirely new system of recorded music . . . perfected by RCA.

The remarkable background of "Madame X"

Now the identity of "Madame X," the *unknown* in a long search for tone perfection, has been revealed. From this quest emerges a completely integrated record-playing *system*—records and automatic player—the first to be entirely free of distortion to the trained musical ear . . .

The research began 11 years ago at RCA Laboratories. First, basic factors were determined—minimum diameters, at different speeds, of the groove spiral in the record—beyond which distortion would occur; size of stylus to be used;

desired length of playing time. From these came the mathematical answer to the record's *speed*—45 turns a minute—and to the record's size, only 6 $\frac{1}{2}$ inches in diameter.

With this speed and size, engineers could guarantee 5 $\frac{1}{2}$ minutes of distortion-free performance, and the finest quality record in RCA Victor history!

The record itself is non-breakable vinyl plastic, wafer-thin. Yet it plays as long as a conventional 12-inch record. The new RCA Victor automatic record changer accommodates up to 10 of the new records—1 hour and 40 minutes of

playing time—and can be attached to almost any radio, phonograph, or television combination.

Not only records are free of surface noise and distortion—the record player eliminates faulty operation, noise, and cumbersome size. Records are changed quickly, quietly . . . RCA Victor will continue to supply 78 rpm instruments and records.

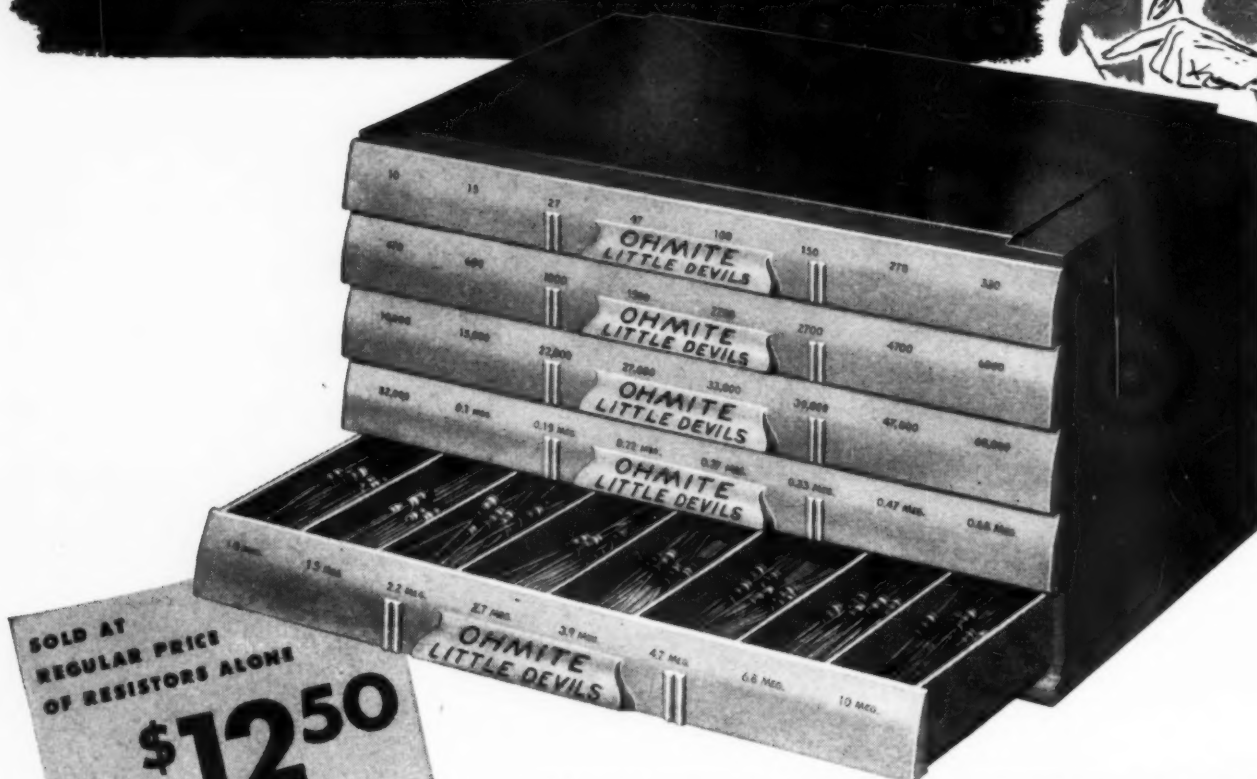
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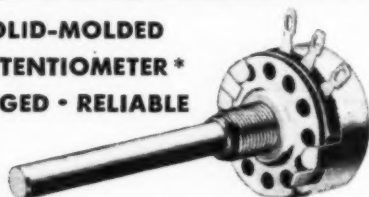
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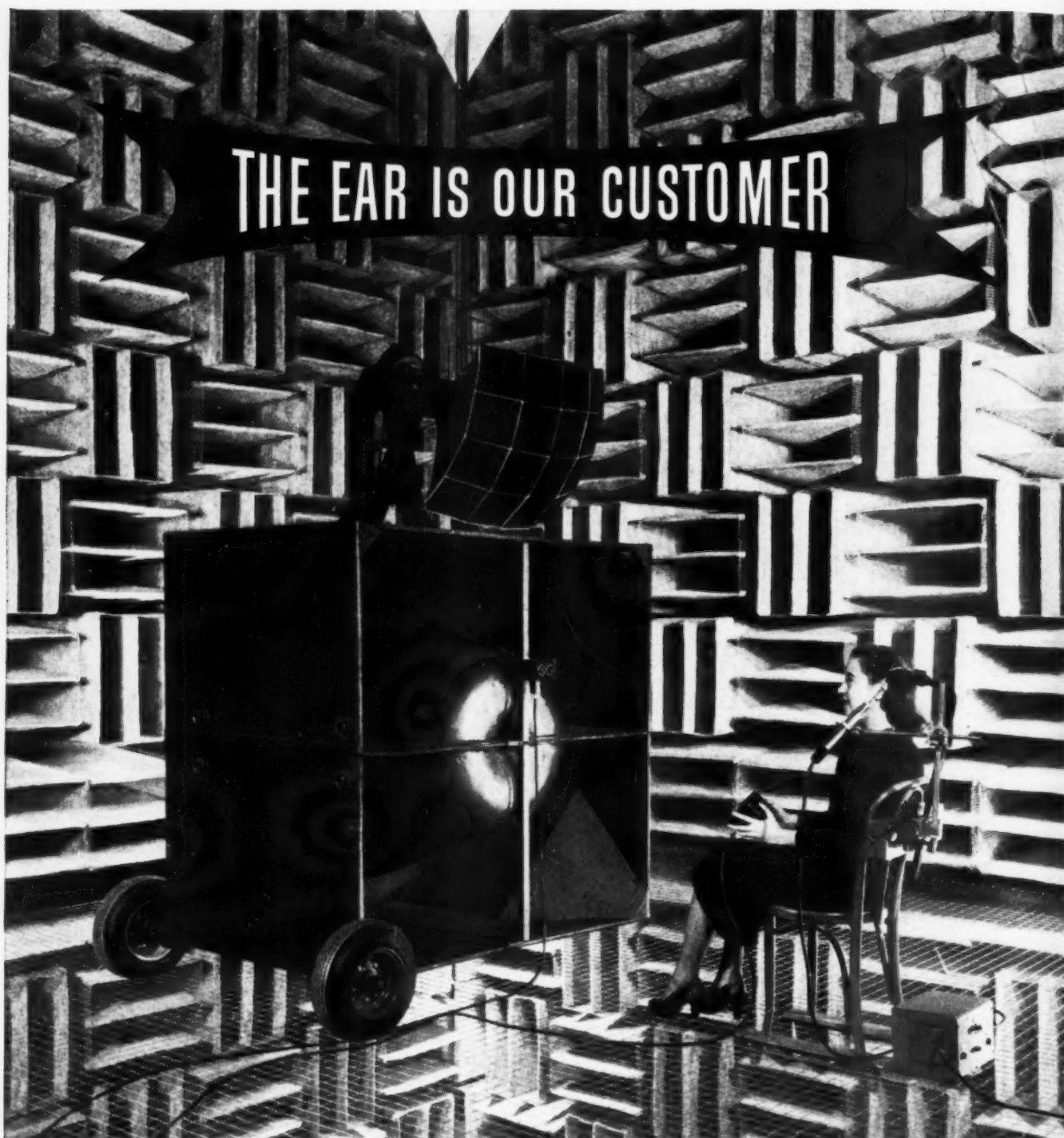
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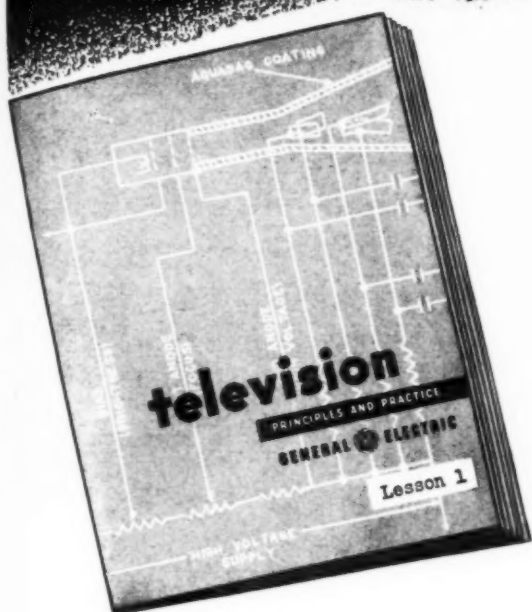
RADIO & TELEVISION NEWS

IN RADIO AND TELEVISION TUBE SALES



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RADIO & TELEVISION NEWS

Don Lee's New \$3,000,000 STUDIOS



By
WALTER W. CARRUTHERS

Chief Eng., Studio Div.,
Don Lee Broadcasting System

The "Electronic Brain" is one of the many unique features of Mutual Don Lee network broadcasting headquarters in heart of Hollywood's radio center.



Shown above is Mutual Don Lee's new three-million-dollar broadcasting building. Insert shows one of the four radio-television studios. Each studio is painted in 19 colors, running through the spectrum from a lemon-yellow to a deep blue-green.

A NEW building has gone up in Hollywood. . . the new home for the West Coast operations of the Mutual and Don Lee Broadcasting Systems, one of the most complete installations of its kind ever to be erected. The growth of Mutual and Don Lee required repeated expansion of the program production and studio facilities in use at the Hollywood headquarters. When the requirements became clear, however, it was decided to make a complete break with the past and design a new network center from the ground up, with new equipment designed specifically to provide the most efficient facilities for both existing and future needs. Description of the three-million-dollar, block-square building divides naturally into two parts: studio complement and acoustic design and program control equipment.

The studio designing program started in 1943 by Willet H. Brown, vice-president and general manager of the Don Lee Broadcasting System, and Walter W. Carruthers, called for four

auditorium sound stages—each 115 feet by 65 feet—four spacious dramatic studios and six smaller commentary and announce booth type studios. Each was studied individually for a particular type of radio program and was built as a separate and completely isolated cement structure. Claude Beelman, architect, tied the eight individual buildings into one four-story structure with general and executive offices, lounges, dressing and conference rooms, and work areas for the many network departments.

In contemplating the design of the new Mutual Don Lee Broadcasting Studios, several problems had to be considered.

Since radio programs usually fall into three general categories—musical and variety, dramatic, and commentary and announcement—each had a

specialized requirement which needed consideration in studio design. To use the space requirements of the musical studios as an example, a certain room size is demanded consistent with a certain type of music. Since we usually hear orchestras in halls bearing certain relationships in size to that of the orchestras, there is an emotional satisfaction when this effect is reproduced. The quality of the reverberation of a large room is successfully simulated at the present time only in rooms of commensurate size. Another way to think of this relationship is as "space effect," an audible perspective to the ear, as "depth" in a picture is perspective to the eye.

In order to facilitate picturing an actual orchestra, the direct sound must reach the ear surrounded by the indirect reflections or reverberation

character of the natural surroundings. Lack of this effect lessens our ability to mentally orient an orchestra with its component parts separated in space, resulting in an underestimation of the size of the orchestra and a diminished sense of the number of instruments playing each part.

Although the number of instruments may be increased in a studio of insufficient volume, the impression of added orchestral size is not proportional; however, where the number of instruments is small compared to the volume normally associated with the group, it is possible, with proper pickup, to create the effect of numbers in excess of those actually employed.

Much has been published on the problem of optimum reverberation characteristic for each type of studio. In order to correlate objective data with the subjective, or "sound," as interpreted by management, producer, artist, engineer, etc., first-hand information was required.

In the growing art of broadcasting, the optimum reverberation characteristic for a given room size has been controversial as with most things dealing with the aesthetic. Programs emanating from certain music halls and studios seemed to score a una-

nimity of opinion as to sound excellence. Equipment capable of producing tones and graphically recording the time of sound decay was moved into these favored places and the resulting curves were compared. There was an unmistakable similarity about all of them. An average of these measurements was taken as the optimum reverberation characteristic. The studio which had a sound characteristic closest to the selected standard was chosen as the place to produce a series of programs, so that a more careful study could be made in listening tests.

Aside from the quantitative aspect, other, more subtle, factors were considered, among them, the shape of each studio. To minimize sound and mechanical transmission, each studio was basically designed within an isolated 8 inch concrete enclosure dimensioned to a ratio of 2:3:5. To minimize standing modes, the inner walls of wooden construction were angled to avoid parallel surfaces. The ceiling was angled with respect to the floor. As a compromise between sound diffusion and the retention of room character, the walls and ceiling were alternately treated with different areas of convex and flat surfaces. For acoustic amplification, the auditorium stages

were shaped to form a gigantic orchestra shell.

In the sound treatment calculation another acoustic factor considered was the use of wood. All areas not otherwise employed were used to expose wooden panels in an effort to gain tonal enrichment by sympathetic vibration. For producing aperiodic irregularities in the reverberation decay characteristic, the sound absorbent materials were randomly placed yet the architectural beauty and symmetry were preserved.

The next problem was to design an auditorium which would conform to the optimum sound characteristic. In earlier building history, such an undertaking would be difficult. Today, with the science of acoustical engineering, it is possible to calculate the sound treatment for a given volume enclosure so that the desired reverberation characteristic can be obtained. The audible spectrum was divided into three regions—high, middle, and low frequencies. Each group was studied separately and given a different type of treatment in an effort to gain the desired results.

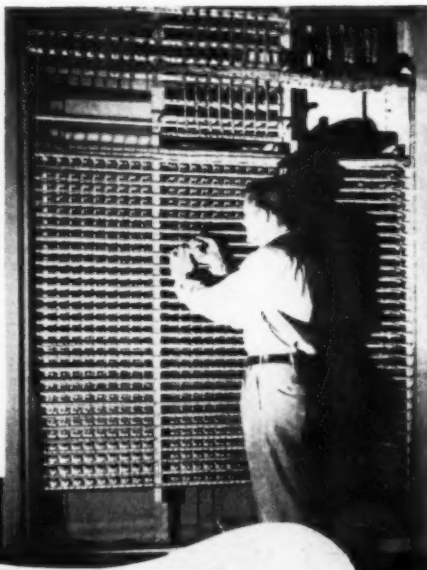
Low-frequency reverberation is usually excessive in rooms because materials normally found there do not absorb the lower tones as rapidly as higher tones. Through use of diaphragmatic areas, control can be exercised in the dissipation of low frequency sound. A "polycylindrical diffuser" is a form which has been used as a low-frequency reverberation control element. It is constructed with a thin sheet of veneer wood bent over a convex form. The wood is at a tension and by virtue of the ribs which are spaced at random, many diaphragms are created which vibrate at different frequencies. The multiplicity effect in the vibrating diaphragms causes an evenness in the attenuation of the low frequency reverberation.

The absorption of middle frequency sound is controlled by the amount of exposed area of such common materials found in the auditorium as upholstered seats, carpeting, drapes and wall treatment. Each material has a different coefficient of absorption, and all surfaces in the room must be taken into account.

High frequencies are usually absorbed to a greater degree by the same material affecting the mid-band frequencies and to further exaggerate the condition, sound travel through the air acts as high frequency absorption. To help compensate for this natural attenuation the convex surface was painted with hard enamel so that while it was acting as a low frequency control it could be highly reflective in maintaining high frequency persistence.

In the Don Lee studios the construction schedule was so arranged that sound measurements could be made as each type of material was added. There was a two-fold purpose in this procedure: (1) The acoustic measure-

Engineer Doc Bennett works on the relays behind the master control unit. The board, which cost \$300,000, is one of the largest control systems in the country.



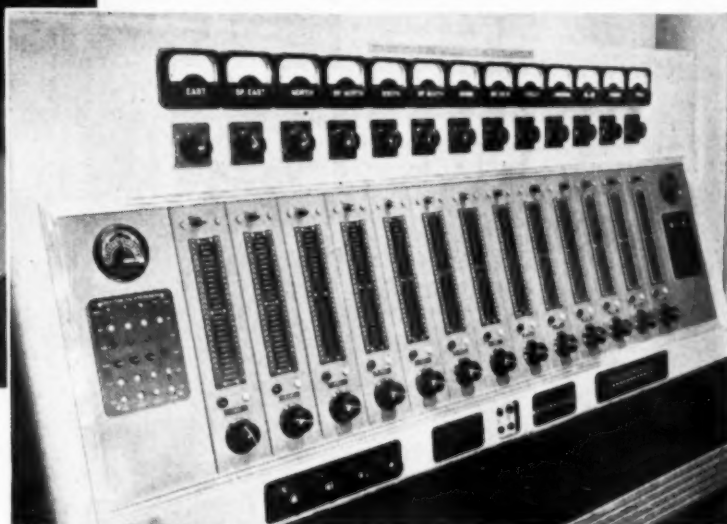
Earl Grant (left, standing), Don Lee Engineer; D. P. Loye, Technical Construction Superintendent for Western Electric; J. Garafalo, Western Electric Engineer; and Walter Carruthers, Chief Engineer, Studio Division, Don Lee, make sound measurements during construction of one of the large auditoriums.





Custom-built speech input console. Mutual Don Lee's new Hollywood headquarters include four large auditorium studios, each 170,000 cubic feet in volume and seating 350 people. All of these four studios have Western Electric control consoles located in the control booths which are at left of the stages.

A close-up of the control panel shows the numerous meters and controls necessary to serve the eleven studios and five different network lines radiating from this network center.



ments gave a family of related curves, each of which allowed a check on predictions as calculated for that stage of the building program. If, at that time, curve measures were indicated, it was simple to make them while that part of the construction crew was still on the job. (2) From an academic point of view the calculation of the sound absorption coefficient of each type of construction and material was made possible which would greatly facilitate the building program in the future by virtue of such information being compiled and available. Fig. 1 shows a typical family of curves resulting from measurements made during the course of construction. Here, for the first time, a building was constructed to the optimum reverberation characteristic indicated by the curves as they approach the dotted line representing the optimum.

It has been the usual practice for network centers to expand facilities on an add-a-unit basis in which the new would supplant the old as it became obsolete. The new \$3,000,000 Mutual Don Lee Broadcasting System plant is different in that with the move to the new quarters there was a complete break away from the old. There was very little, if any, transfer of equipment. Fortunately, the change had been anticipated for sufficient time to allow research and development with the exacting standards and demands imposed by modern AM, FM and television broadcasting.

In considering the studio control desk and master control room equipment, the engineering and developmental services of *Western Electric* were called upon to pose problems and needs and to share the vast experience and engineering background acquired through many years in the field of telephone communication.

The present master control equipment is the result of a vast amount of collective study over a period of years. In the early days of the net-

work, the switching was done by patch cords in which the line from the originating studios was manually patched into the telephone lines. The "patch-up-bridging bus-system" of program distribution proved inadequate as it became common for a number of programs to stop and others to start at the same time, and there grew a need for a coordinating center in program switching. Relays were substituted for patch cords. A system of pre-set selection followed, allowing the operator to anticipate forthcoming programs rather than act under the pressure of time.

With the rapid advance in the D. L. B. S. network activities, the installation became overloaded and obsolete. In 1934 a master control switching panel was set up using *Western Electric* locking 92 type keys to activate the relays. One hundred and forty-four program switching possibilities

were represented by 144 keys. There were twelve incoming and twelve outgoing lines.

In 1940 a move to the Melrose Ave. location gave rise to a larger and more complex master control system. The switching panel was expanded to a 17x20 board with 340 possible connections. For presetting, 92 type keys were replaced with rotary switches at the bottoms of the strips of green and red lights. Above each strip was located a volume indicator. It was then only necessary to rotate the switch until a green light stopped opposite the desired switch to be made. Then by push button a red light would be lit opposite the green showing the switch had been completed.

In 1948 a system was evolved which was a far cry from the early days of patch and cord switching. *Western Electric* engineers were invited to sur-

(Continued on page 156)

Over-all view of master control panel. Built by *Western Electric*, this master control incorporates a switching system for over 800 possible program combinations and requires 821 relays, 49 amplifiers, 850 indicator lamps, 2500 jacks and 13 volume indicators. This entire system can be controlled by only one man.



How To Eliminate **AUTO RADIO STATIC**

By
M. C. ANDERSON

*Locate that baffling source of static
noise by means of these to-the-point suggestions.*

THERE is nothing mystifying about radio static to most amateurs, and the average radio fan, up against a static problem, would start a systematic check to eliminate the noise. Put the radio in an automobile, however, and we have to contend with the ignition and other units with which the radio man may not be familiar. Anyone can improve auto radio reception and eliminate annoying static noises by a few simple tests which require no special equipment whatsoever.

One way to eliminate noises, of course, is to remove the radio from the noise source, provided the cause is external. In autos, however, this is seldom possible, since mounting space is at a premium. The radio must generally be mounted right in the midst of a whole group of static-producing units. In spite of this, it is usually a comparatively simple matter to eliminate noise from the auto radio by checking it at its source.

Location. Though the choice of mounting locations for the auto radio is likely to be small, an attempt should be made to locate the radio as far from the ignition coil as possible. Generally speaking, a position at the extreme upper-right side of the dash is best for most installations; however, often some other location must be chosen because of interference with the heater or other equipment. In any case, make certain that the radio is well grounded to the dash through the mounting bolts by thoroughly cleaning the metal before tightening down the nuts.

Ignition system. The ignition system is commonly thought to be the worst static producer on the automobile, probably because of the high voltages used to jump the

spark gap. Actually, if the ignition system is in good condition it may give much less static trouble than other often unsuspected parts, such as the tires.

If the motor does not run evenly or shows other signs of ignition system trouble, chances are that the system will be a noise-producer. In this case, the system should be thoroughly checked.

Ignition system noise, if present, is usually easy enough to distinguish from other static noises. Tracking down the source of the leak may not be so easy. Begin by checking and regapping the spark plugs to the manufacturer's specifications. Plugs which have worn over the specified gap clearance will be likely to cause radio noise. Noise suppressors may be mounted on top of the spark plugs if subsequent tests indicate that they are necessary. These should be mounted in a horizontal position, or parallel to the head of the engine, as shown, if possible. Make certain that the suppressors are not near any wires, fuel or oil lines, or the like, which might pick up radiation and carry it to the radio. A good test to run on these suppressors after installation is to check continuity from the distributor cap to the spark plug with a battery light. An open circuit will cause arcing and radio static.

While the distributor is open, check the condition of the breaker points. Burned or pitted points will cause radio noise and should be replaced rather than filed. Point clearance should also be checked and correctly set at this time, or you may have your local garage do the job for you on a distributor test machine. Check the condition of the distributor rotor and distributor cap contact points. They should be clean and bright. If the points are pitted or burned, replace the rotor or distributor cap, or both. The rotor point to distributor cap contact clearance is also important and must not be excessive, or the resultant arcing will be heard in the radio. A gap of over .005" is likely to cause trouble here, and should be decreased either by installing a new rotor, or building up the old one by adding solder to the end of the electrode. Take care, however, that the point is not lengthened enough to strike the cap electrodes causing breakage. A suppressor may be used at the center lead of the distributor also, and should be placed here in preference to the cable outlet at the ignition coil.

If all these check-points are carefully inspected and cared for, and the ignition noise still persists in the radio, it is likely that the static is being transmitted to the radio by parts outside the ignition system. The choice may be narrowed somewhat by disconnecting the antenna from the set. If the noise persists, it is being transmitted through the frame of the car, but if it subsides, it is being picked up from the antenna. If the trouble lies in the antenna, check the lead-in for proper shielding and make certain that the lead-in shield is well grounded. No part of the antenna system itself must touch the car.

If the noise does not decrease when the antenna is dis-

Poor ground connections on cables and rods which pass through the firewall may be quickly located by shorting them to the wall.



connected, showing that it is being picked up from the chassis, check the ground connections on the radio, engine, and on all rods or lines passing through the dash. A file is a handy tool to use when checking grounds, since the teeth bite into the metal and give a good contact on painted or greasy surfaces. Check the speedometer cable, choke and throttle rods, oil lines, etc., by grounding them to the dash with the file. If the noise decreases, ground the offending part with a short length of copper braid well-soldered to both the rod and the dash of the car. Do this at the dash itself, using a length of braid just long enough to allow free movement of the control. Wires entirely outside of the ignition system sometimes pick up and transmit ignition noises. Check to see if any low-voltage wires (such as the generator leads) run through the same housing with the ignition wiring. If so, remove them and reroute the wires away from the ignition system. In extreme cases, it may be necessary to slide a flexible woven wire shielding over such wires to prevent radio interference. Check all wiring connections, such as those at the generator, ammeter, oil pressure gauge, etc., to make certain that they are tight. When making these tests, the radio should be tuned off-station for maximum sensitivity and the volume turned full on. Then, any variation in the noise level will be most apparent, since the static noise will be at its peak.

Generator. Generator noise may usually be eliminated by a condenser shunted across the cutout. Mount the condenser under one of the cutout mounting screws and attach the lead to the generator side of the cutout.

Clean the commutator with fine sandpaper and see that the brushes are making good contact. Brushes which have worn short will give poor contact due to low spring tension and should be replaced to prevent arcing and radio interference. Be sure to properly seat in the new brushes by running a strip of fine sandpaper about the commutator, rough side out, and drawing it back and forth to cut the brushes to the contour of the commutator.

In some cases, a second condenser may be necessary, connected across the generator armature terminal to a good ground on the generator housing.

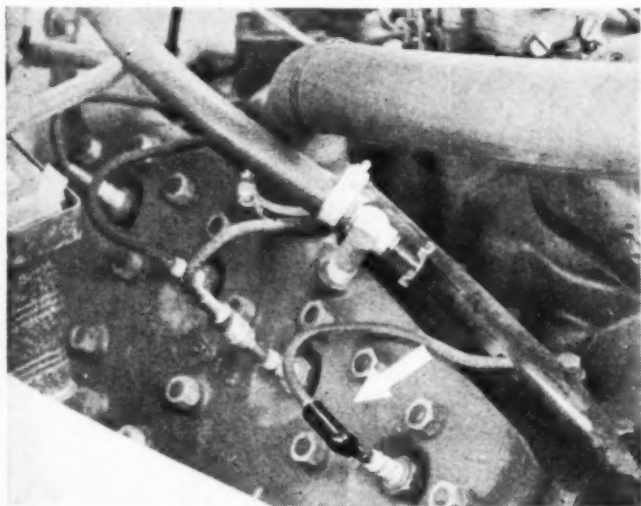
Generator noise may be identified as a howl or whine in the receiver which will begin when the motor is speeded up sufficiently to operate the cutout and cause the ammeter to register charge. This may be further verified by speeding up the engine and then shutting it off. The noise, if it is being caused by the generator, will persist, dropping off as the generator loses speed and the engine finally comes to a stop.

Tires. Considerable trouble has been experienced with radio noise caused by static electricity generated by the tires, and especially so in the case of synthetic rubber tires. Tire noise is usually heard as an almost continuous roar in the radio. The noise will be heard only when the car is on the road and in motion, and the radio may work perfectly while the car is standing still, even with the engine running.

(Continued on page 125)



↑ (1) It's important to check on the distributor point clearance as well as the condition of the points themselves. (2) Spark plug gaps, if incorrect, can increase radio static noise. (3) If generator noise is heard in the radio, it may be necessary to seat in the brushes with sandpaper. (4) Distributor rotor to electrode clearance is important to good reception; watch for pitted contacts.



← Spark plug noise suppressors are of two types. The kind that is mounted parallel to the engine head (arrow) reduces the chances of transferring the noise to other wiring points.

By adding this pre-amplifier to your present receiver, better reception is obtained from remote FM stations.



Fig. 1. Top view of the home-built pre-amplifier. Although designed specifically for the FM band, this booster, with modified coils, can be made to cover TV and the 10, 6, and 2-meter amateur bands.

A Booster For Your FM RECEIVER

By

PETER G. SULZER, W3HFW

Engineering Experiment Station,
The Pennsylvania State College

THE writer happens to be in a very poor location for FM reception. There are no local stations, and the antenna cannot be mounted on a high tower because of building restrictions. Measurement of the receiver sensitivity showed that it was not all that it might be. This unhappy situation led to a study of the limitations of receiver sensitivity, which resulted in the design of the preamplifier to be described.

At first glance it might appear that, in the absence of atmospheric or man-made noise, any number of amplifier stages might be added ahead of a receiver to increase its sensitivity. However, this is not so for two reasons. The first is that the amplifiers themselves contribute noise—tube noise. The second, and much more fundamental reason, is that the antenna itself contributes some noise as a result of thermal radiation from its surroundings. Since the objects around the antenna, including the earth and sun, are hot, they radiate heat. Some of this is picked up by the antenna, and appears as a random voltage at its terminals. It turns out that the magnitude of the voltage depends upon the resistance presented by the antenna.

In fact, the antenna can be replaced by an equal resistance, and the same noise voltage will be obtained, provided the resistance is maintained at the same temperature as the objects around the antenna. It is this noise voltage, *Johnson Noise*, which places a limit on the amount of amplification that can be placed ahead of the receiver. Even if the amplifiers themselves were perfect, the receiver could be made to overload on Johnson noise alone with sufficient amplification.

Obviously, it is desirable to make the receiver as sensitive as possible. This involves, then, not only sufficient amplification, but also low-noise amplifiers. The noisiness of an amplifier is expressed in terms of "noise figure," which is the ratio of the total noise output of the amplifier to the output that would result from Johnson noise alone. A perfectly noise-free amplifier would then have a noise figure of 1. All amplifiers do contribute some noise, and consequently have noise figures greater than 1.

Tubes contain many sources of noise. The basic one, however, results from the fact that electrons are discrete charges of electricity. Therefore, every time an electron passes the grid, a small voltage is induced in it, which is amplified and heard as noise. Another source of noise is encountered in pentode tubes, or in any tube with positive grids which draw current. Since the

current must divide between the positive grid and plate, this division takes place in a random manner. The result is, again, more noise. Other noise sources, such as gas and hum, are not important here because of the high frequencies involved.

Preamplifier

It appears, then, that a triode tube, which does not have a positive grid, is best for the preamplifier. Unfortunately, as is well known, neutralization is required. Although the triode could have been used as a grounded-grid amplifier without neutralization, it has been the writer's experience that a better noise figure can be obtained with the ordinary, neutralized connection. A fair amount of gain is required to override the receiver noise. Calculations showed that, in this case, two stages would be necessary for a band width of 15 megacycles, which is required to cover most of the FM band.

Figs. 1 and 3 are photographs of the preamplifier, which was constructed on a narrow chassis-base to permit placement inside an S-55 receiver. Fig. 2 is the schematic diagram showing two stages, with V_1 connected as a triode for low noise and V_2 connected as a pentode for high gain.

The coils, L_1 , L_2 , and L_3 , are slug-tuned without any additional capacity, for maximum bandwidth. Loading resistors R_1 , R_2 , and R_3 are used to obtain still broader tuned circuits. The second stage, V_2 , is a conventional pentode amplifier, with link coupling to the receiver. It will be noted in the parts list that all bypassing is done with button-type silver-mica condensers. Although these condensers are fairly expensive (even on surplus) it was felt that they should be used because they permit very low-inductance connections. It is possible that small, tubular ceramicons might be substituted with only a small sacrifice in performance.

The first stage, V_1 , has the screen-grid and plate tied together to obtain a triode connection. As mentioned above, neutralization is necessary, which is accomplished by means of L_2 . This coil "tunes-out" the grid-to-plate capacity, resulting in a high imped-

ance, which prevents feedback and oscillation. The antenna is link-coupled, the number of turns having been adjusted for optimum noise figure with a 300-ohm feeder. A center-tap is brought out so that the FM antenna can also be used on the broadcast-band without affecting its FM performance.

The power supply is novel in that two filament transformers are used "back to back" to obtain the required voltages. Filament transformer T_1 , which is connected to the a.c. line, provides heater voltage for the tubes, and drives T_2 , which gives about 90 volts a.c. for the rectifier plate supply. In this way, it was possible to use two very compact transformers and a single selenium rectifier. The preamplifier could be operated with an a.c.-d.c. power supply, eliminating the transformers, but it was considered undesirable in this case. It is possible that the receiver itself could supply the power, since the requirement is only 6.3 volts at 0.35 amperes and 75 volts at 20 milliamperes.

Construction

Figs. 1 and 3 show the parts layout used. This should be closely followed for best results. It is necessary that the three coils, L_1 , L_2 , and L_3 , be mounted at one side of the chassis-base rather than in the center, to decrease the coupling between them. The selenium rectifier can be mounted under the chassis-base because the heat dissipated is very small with a current of only 20 milliamperes.

When wiring, C_1 and C_2 should be returned to one of the screws mounting the socket of V_1 . C_3 should be returned to the other screw on the same socket. In the same manner, C_4 and C_5 should be returned to one of the screws mounting the socket of V_2 .

The tuning coils L_1 , L_2 , and L_3 were wound on surplus slug-tuned forms. If these are not available, National XR-50 forms will do very well. When mounting L_2 , the neutralizing coil, it should be placed at right-angles to L_1 and L_3 .

Adjustment

After the wiring is finished, the grid of V_1 should be grounded to prevent oscillation, and the power should be turned on. The plate supply should be approximately 75 volts, while the drops across R_2 and R_3 should be about 1 volt, indicating cathode currents of 10 milliamperes in each tube.

If everything is satisfactory, the link of L_1 can be connected to the receiver through a short piece of twisted-pair. If long leads are necessary, 300-ohm twin-lead should be used. With the receiver set at 100 megacycles, a very noticeable peak should occur in the noise as L_1 is tuned through its range. Both L_2 and L_3 should be set for maximum noise output at the middle of the FM band.

It is next necessary to neutralize V_1 . This can be accomplished by ungrounding the grid, and disconnecting R_2 at the connection C_2 - R_2 . If a signal generator is available, it should be

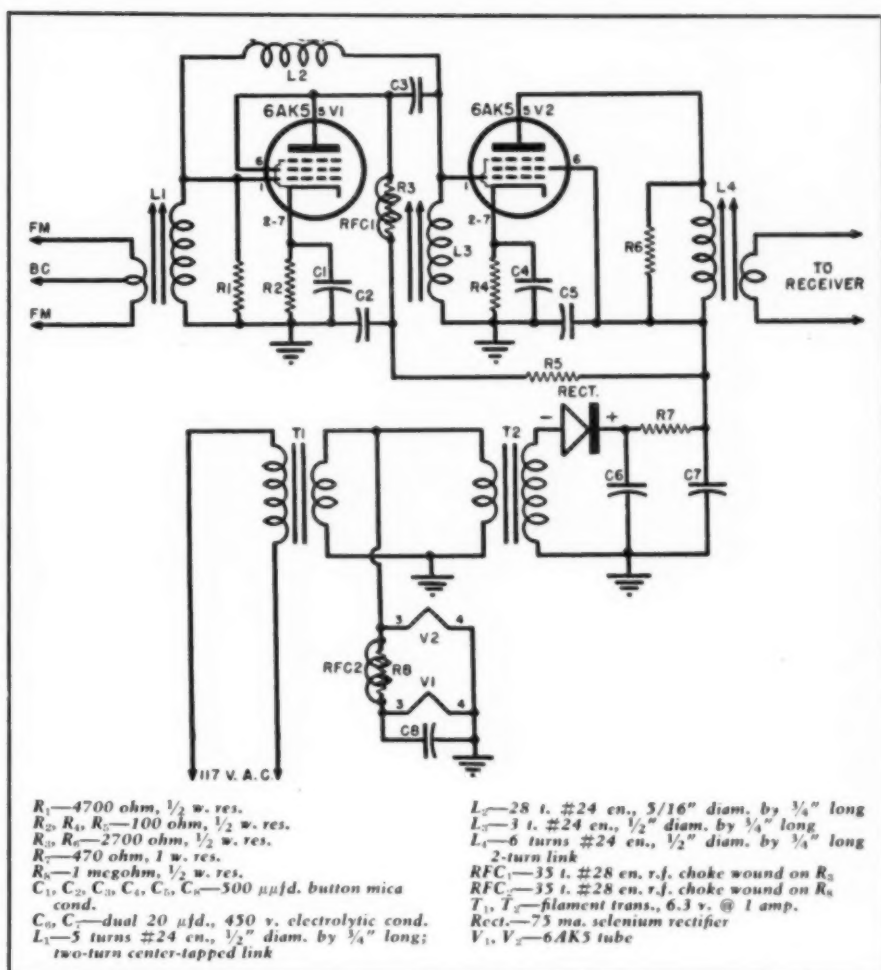


Fig. 2. Complete schematic diagram of the self-contained two-tube FM booster.

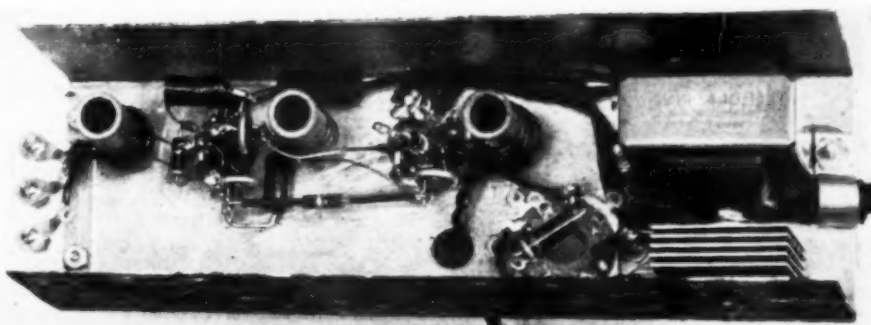
connected to the antenna terminals and tuned to the receiver frequency. If not, the antenna should be connected, and a strong station near the center of the band tuned in. It is necessary to vary the inductance of L_2 to check for neutralization. This can best be accomplished by means of a tuning stick, which has a copper slug on one end and a piece of powdered iron on the other. As one end or the other of the tuning stick is inserted in L_2 , a sudden dip will be noted in the receiver output. The dip is the desired condition, since there is then no coupling from grid to plate, or vice-versa. If it is necessary to insert the copper slug to obtain a dip, the inductance is too high, and the coil should be spread out, or should have turns removed. The re-

verse applies, of course, if the iron slug produces a dip. When the proper adjustment is obtained, a dip will be obtained without the insertion of either slug, and inserting either slug will make the signal stronger. At this point the coil should be coated with coil dope.

The antenna can then be connected, and plate voltage can be restored to V_1 by reconnecting R_2 . L_1 should then be tuned for maximum noise at the band center. The FM receiver can then be tuned through the entire band. There should be no sharp peaks of noise at any one frequency, since these would indicate regeneration or oscillation. If there are, the adjustment of L_1 can be checked.

(Continued on page 131)

Fig. 3. Under-chassis view of pre-amplifier shows relative placement of components.



A Novel Plate-Dip OSCILLATOR

By E. J. SCHULTZ, W2MUU

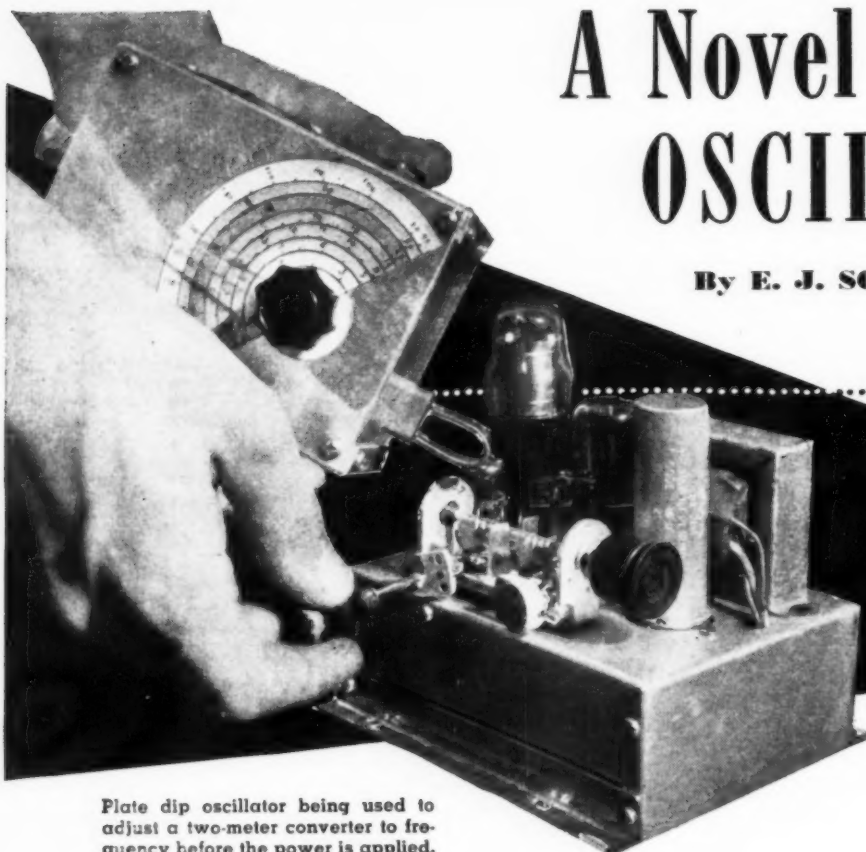


Plate dip oscillator being used to adjust a two-meter converter to frequency before the power is applied.

This instrument can be used to measure resonant frequency of circuits, as a signal generator, and as a field strength meter, harmonic checker, etc.

MOST amateurs and experimenters are familiar with the versatile instrument known as the grid dip meter. In short, a grid dip meter is an oscillator with a meter connected in its grid return indicating oscillator grid current. The current is relative to the strength of oscillation and if the oscillator circuit is loaded, the meter will register a decrease proportionate to the load. The meter, therefore, can indicate the resonant frequency of a tuned circuit by coupling the oscillator to the circuit in question and varying the frequency of the grid dip meter until a pronounced dip occurs. Conversely a trap or other tuned tank to be adjusted to a given frequency can be set by leaving the instrument frequency constant and tuning the unknown circuit to resonance as indicated by the grid dip.

The instrument herein described performs in essentially the same manner, with the exception that the dipping meter is placed in the plate circuit instead of the grid. In the conventional oscillator circuit normally employed in instruments of this type, the plate current increases with load and the change is relatively small as compared with the grid. However, the oscillator diagrammed in Fig. 1 is un-

conventional to say the least, the plate current vastly *decreasing* with small loading. Using a 6J6 twin triode, the oscillator is the negative resistance type of excellent stability. It is a war-born device which, in circuitry, is similar to a multivibrator. The particular circuit was chosen as it eliminates the need for coils with feedback windings and taps or a clumsy split-stator condenser as used in a Colpitts oscillator. Furthermore, the oscillator output is nearly constant over its useful range, only falling off slightly at the low frequency end of the highest band. Continuous coverage from 3 to 160 megacycles is obtained in 7 ranges with useful bandspread as each range covers slightly less than 2 to 1. Seven plug-in coils are used to change frequency. A reduction in the amount necessary for coverage of the range could be achieved by employing a larger tuning condenser with an attendant loss in bandspread.

The instrument was built in two parts, the oscillator and its components in one box and a power supply and compartment for the coils in the other. It was considered desirable to connect the units together with a cable from the oscillator terminated in a terminal strip on the power supply, as it might

be necessary to operate from battery power in the field.

The oscillator is built around a Hammarlund Mc-50-S condenser, the tube socket being mounted on a bracket on the rear of the condenser for short connections. Any similar condenser may be used, but the double bearing type is preferable and straightline frequency construction, while not essential, is highly desirable for uniform dial calibration.

The $\frac{3}{4}$ " poly coil forms employed were mounted on strips of polystyrene provided with pins from discarded octal tubes, spaced $\frac{1}{2}$ ", so as to plug into a crystal socket. If the regular miniature coil forms with prongs are available, they are to be preferred, as they eliminate the need for making the previously mentioned polystyrene strip plugs.

A double-pole switch, labeled "det.-osc." in the schematic, removes plate voltage from one of the triodes and simultaneously increases the cathode bias, making the input triode a plate detector. The plate detector is a much more sensitive device than a diode as is provided by the usual grid dip meter in a non-oscillating condition, and the instrument can be used as a tuned vacuum tube voltmeter because the plate current will increase sharply when the instrument is loosely coupled to an r.f. source and tuned to resonance. A jack is provided for earphones (any type except crystal earphones may be used) and the instrument serves as a phone monitor in the detector position of the switch and as a c.w. monitor with the switch set to oscillate. A dry cell is connected across the meter and, in conjunction with a potentiometer, provides a variable bucking voltage to enable zero or full scale adjustment without varying the

instrument's sensitivity which would occur if a variable shunt across the meter was used. In "osc." position the potentiometer is adjusted to give full scale reading, resonance of an external circuit is indicated by a dip. When used as a detector the meter is set to zero and the current increases when the instrument is resonated with an r.f. source. The potentiometer is equipped with a switch to remove the bucking voltage from the meter when the instrument is not in use. The one-mil. meter employed in the model proved inadequate as the dip obtained when a resonant circuit was approached drove the meter off-scale in a negative direction. A shunt was therefore employed to slightly desensitize the instrument. If a 2- or 3-mil. meter is used, the shunt will not be necessary. An NE-51 neon bulb mounted on the oscillator serves the dual function of a pilot light and a voltage regulator maintaining the voltage fairly constant at about 105 volts.

These tubes vary widely, however, in their operating voltage, and it might be better to use a VR-150 in its stead. The filament transformer is used in the conventional way, while the output transformer is connected backwards. The secondary tap, giving sufficient output voltage across the primary to cause the neon tube to ignite, is selected by experiment. Very probably the proper tap will be the 4, the 8, or the 15.

The primary of the output transformer connected between ground and a selenium rectifier with an R-C filter completes the power supply. The two boxes housing the oscillator and the power supply are identical with the exception that a piece of polystyrene was used on the end of the oscillator housing instead of aluminum and one side of the power supply was cut and fitted with miniature 10 cent hinges, forming a door, and providing access to the coil compartment. The boxes measuring 3" x 4" x 5½" were both made from ¾" aluminum and were bent without the aid of a brake by using pieces of angle iron in a vise. Commercially available metal boxes can, of course, be used, but the ones available hereabouts are not wide enough to take a 2" meter on the side.

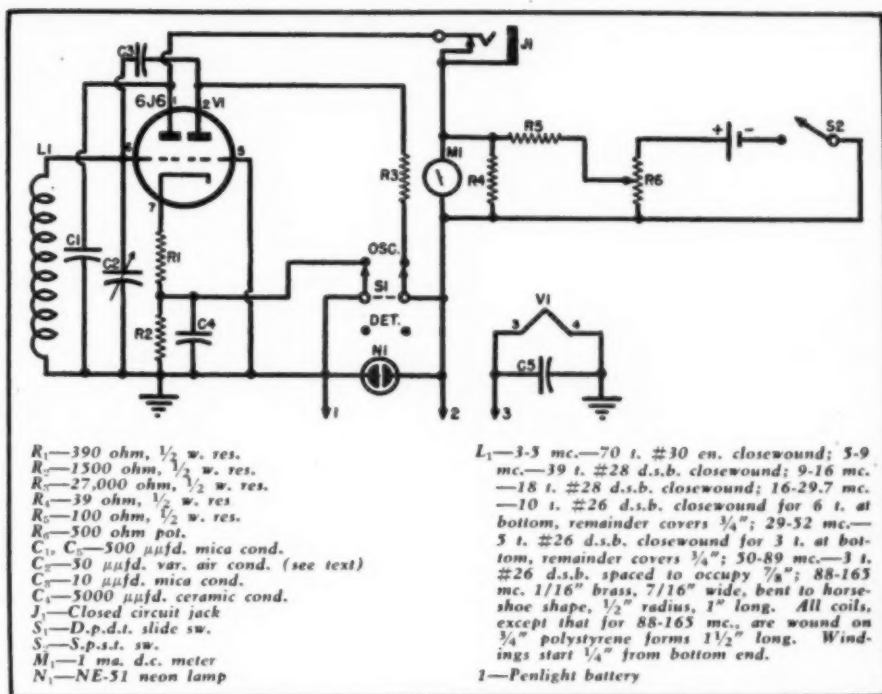


Fig. 1. Circuit diagram of the novel plate dip oscillator unit.

However, by using one of the new miniature 1" meters or by changing the layout, they could, no doubt, be employed.

The dial pointer is made of a piece of ¼" Plexiglas screwed to a conventional bakelite finger grip knob drilled and tapped for the purpose. The dial is made of a small piece of double-weight Bristol board purchased from the local art supply shop. It has a semi-gloss surface and readily accepts ink without preparation or blotting. Calibration was made by drilling small, evenly-spaced holes in the pointer and inserting a needle through the holes at appropriate points on the dial scale, later inking the points in. The dial scale is fastened to the instrument with rubber cement or Duco.

Calibration can be made, of course, using a number of methods, the method selected depending upon the equipment available and accuracy required by the individual's requirements. Calibration adequate for general purposes can be made using communications

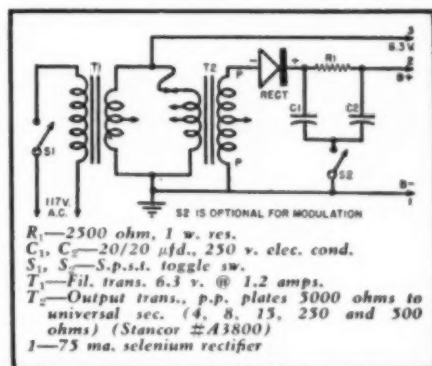
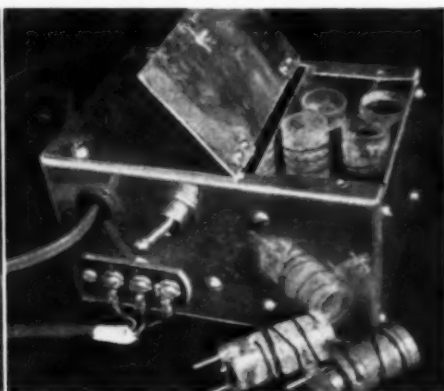
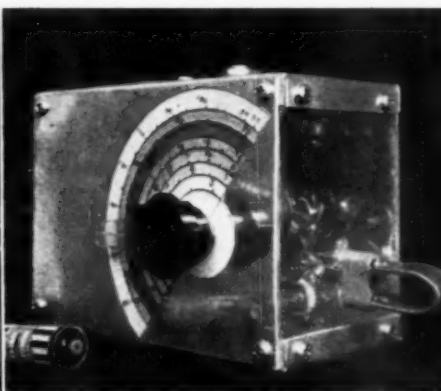
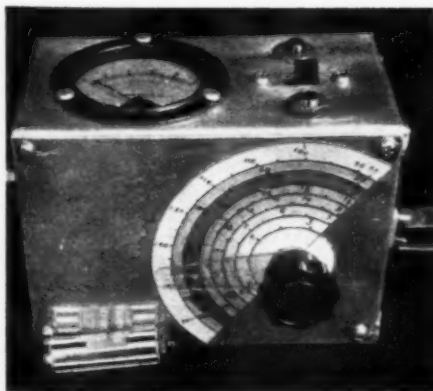


Fig. 2. Circuit diagram of power supply used in conjunction with plate dip oscillator. The center taps on the secondaries of both transformers are not used.

receivers for the low ranges and absorption meters or Lecher wires on the high bands. The instrument's accuracy is dependent on the accuracy of the calibration source and the care of the calibrator. For greatest accuracy (Continued on page 130)

(Left) Side view of instrument showing dial detail, layout of meter, switch, neon bulb, and jack. The penlight cell indicates comparative size. (Center) End view showing polystyrene endpiece. (Right) Over-all view of power supply unit. A separate coil compartment, shown with the door open, is incorporated. A three-wire cable supplies power to the instrument.



The receiving test. Here is where you worry a bit. Confidentially, this "ham" got through all right and is now operating as W1RWV.



The BEGINNING AMATEUR

By
ROBERT HERTZBERG,
W2BJJ

Part 4. The FCC tests for ham licenses are like any other exam. They're easy—if you're prepared.

THREE tall young men, wearing the white-and-blue sweaters of a large Brooklyn high school, hovered in front of a door marked *Federal Communications Commission—Radio Operator Examinations* in a building at 641 Washington Street, New York. They were whispering to themselves and quite evidently were undecided about going in.

"Gee, I don't think I'm up to it, now that we're here," said one of them, as he eyed the door nervously.

"We came this far," said another, "so let's make a stab at it. What can we lose?"

The three brushed their hair back with quick waves of their hands and piled through the door as one. You'd think they were being called on the carpet to answer for some serious infraction of school rules, instead of merely making an entirely voluntary trip for the purpose of obtaining radio amateur operator and station licenses . . . "ham tickets." Behind the fateful door they found a large room, with a couple of desks in the center. Still fidgety, they approached and in unison mumbled something that sounded remotely like, "We'd like to take the ham license test."

The FCC engineer smiled at them in a most friendly manner and said, "Sure, boys. I'll give you the application forms to fill out."

As he turned around to a filing cabinet he whispered to me, "Scared stiff, aren't they? No reason for it, either; we're here to help 'em."

Turning again to the three he continued, "Now, boys, just make yourselves comfortable at one of those tables and fill out these forms carefully. Relax and take your time. If you have any questions, just ask me."

Breathing more easily, the three young men took the forms to a table, sat down, unbuttoned their sweaters, and began to regain some of the color in their cheeks. Still whispering, one of them remarked to no one in particular,

"Hey, that guy's all right."

The FCC Form 610 they were given was headed *Application for Amateur Operator and/or Station License*. Each applicant filled in his pedigree: name, address, place and date of birth, etc., and repeated some of the information on a separate little card. The whole operation took five minutes. They carried the forms back to the FCC man, who examined them quickly with a practiced eye.

"These look OK," he said. "The first part of the exam is the code receiving test." He hesitated a moment as he saw the boys going pale again. "How about taking a dry run, boys? Just listen for a few minutes to get an idea as to how the stuff sounds."

Grateful beyond expression, the applicants followed the examiner into an adjacent room that had a familiar air to it. It was fitted with about two dozen of those little wooden desks found in schools everywhere. On each was a pair of earphones, a key and an inkwell and pen. The boys put on the

phones and listened intently as precise, machine-made dots and dashes filled their ears.

At the automatic tape transmitter used for the code tests, the FCC engineer adjusted the speed control knob a bit.

"The prescribed speed for the test is thirteen words per minute, plain text," he said to me. "The 'plain text' consists of understandable words, but the whole transmission doesn't necessarily make sense as a series of words and sentences. Numbers and 'Q' signals are thrown in at random, and the applicant must copy what he hears. Wait a minute; I'll get those boys started."

He went back into the examination room, handed each young man a couple of sheets of blank paper and said, "The next run will be for the record. Write clearly. The tape will be on for five minutes. If you copy any one minute's section without error, you pass. Take it easy. Good luck."

With a reassuring smile he returned to the tape machine and flipped it on. Their noses almost touching the paper, the boys wiggled their pencils furiously as the transmission got under way.

"This is the most important part of the test," continued the FCC man. "If an applicant flunks at this point, he's through. He can come back after thirty days and try again. How many times can he try? As often as he wants, just so he waits thirty days in between. We've had a couple of people who made six attempts before they passed, but that's unusual."

"My best suggestion for prospective hams is that they practice thoroughly and become proficient at fifteen words per minute or more before they attempt the exam. Too many of 'em rush right down after they hit thirteen. Surroundings here are different than at home, and almost everyone suffers from a little 'buck fever'. Another thing: our thirteen words per

←FCC Engineer Walter J. Howell adjusts the speed of the automatic code transmitter in the examining room of the FCC. Like so many other FCC men, Walter himself is a ham, holding the call W2IL. He is a real old-timer, having obtained his license back in 1913.

Sending may seem a little better than receiving to the applicant. Here a potential licensee attempts to prove he knows his code, while FCC examiner Charles Finkleman, standing, lends a critical ear to the neophyte's dots and dashes.

←Your receiving test is checked, while you stand by nervously. If your code, receiving and sending tests have been found to be okay, the next step is a written examination.

↓ The examination room. Here a group of applicants takes the written test, which lasts from an hour to an hour and a half. Then you await results!

minute rate is really thirteen words per minute; no more, no less. When an applicant remarks that the test sounded too fast we just laugh."

At the end of the five-minute run, the FCC examiner immediately took the papers from the young men, before they had a chance to go over their "copy." He checked the results and in a few minutes announced that they had all passed.

"Now let me hear you send," he said. The group returned to the exam room, and the examiner listened with a pair of phones as each boy transmitted a sentence or two. "All OK, all OK. Now you get the written part. I'll give each of you a packet. Read the instructions on the envelope and go to work. You can take all afternoon if you want."

The packet contained five double pages of questions of the multiple-choice type. About thirty are devoted to technical topics and the rest to the rules and regulations. Several of them require the applicant to draw schematic diagrams. Most of the questions are pretty easy for anyone who has

read any of the standard ham license manuals. A typical question might read like this:

The unit of resistance is the

1. Volt
2. Ohm
3. Cycle
4. Centimeter
5. Ampere.

Answer:—

For the answer, the applicant merely writes in the appropriate number. "Many people concentrate on learn-

ing the receiver and forget that they have to know how to transmit too," said the FCC man as the boys busied themselves with their papers. "We get quite a lot of applicants who sail right through the receiving part and then flunk out on sending."

The rest of the license procedure is simple. After the would-be ham finishes his written test, it is collected by the examiner, who, oddly enough, (Continued on page 108)

DIRECTORY OF TELEVISION RECEIVER MANUFACTURERS

Admiral Corporation
3800 W. Cortland St.
Chicago 47, Ill.

Airadio, Inc.
Melrose Ave. & Barry Pl.
Stamford, Conn.

Air King Products Co., Inc.
170 53rd St.
Brooklyn 32, N. Y.

Andrea Radio Corp.
27-01 Bridge Plaza N.
Long Island City 1, N. Y.

Ansley Radio & Television, Inc.
41 St. Jones Ave.
Trenton, N. J.

Approved Electronic Instrument Corp.
142 Liberty St.
New York 6, N. Y.

Arcturus Radio & Television Corp.
19 Nesbitt St.
Newark, N. J.

Atlas Coil Winder, Inc.
192 State St.
Stamford, Conn.

Atlas Radio & Television, Inc.
26 Journal Square
Jersey City 6, N. J.

Audar, Inc.
Walnut & Maple Sts.
Argos, Ind.

Automatic Radio Mfg. Co.
122 Brookline Ave.
Boston 15, Mass.

Bace Television Corp.
Green & Leuning Sts.
S. Hackensack, N. J.

Bell Radio Co.
125 E. 46th St.
New York 17, N. Y.

Bell Television, Inc.
147 West 42nd St.
New York 18, N. Y.

Belmont Radio Corp.
5921 W. Dickens Ave.
Chicago 39, Ill.

Bendix Radio
Division of Bendix Aviation Corp.
Baltimore 4, Md.

Bowen & Co., Inc.
4712 Bethesda Ave.
Bethesda, Md.

Bowers Radio & Television Co.
44 S. 6th St.
Reading, Pa.

Brite-Ray Television Co.
7 Clinton St.
Brooklyn, N. Y.

Brunswick Radio & Television, Div.
Radio & Television, Inc.
244 Madison Ave.
New York 16, N. Y.

Cage Projects, Inc.
393 Grove St.
Upper Montclair, N. J.

Certified Television Laboratories
5507 13th Ave.
Brooklyn 19, N. Y.

Cleervue Television Corp.
81 Willoughby St.
Brooklyn 1, N. Y.

Colonial Radio Corp.
254 Rano St.
Buffalo 7, N. Y.

Colonial Television Corp.
780 E. 137th St.
Bronx 54, N. Y.

Columbia Radio & Television Co.
85 Tompkins St.
Staten Island 4, N. Y.

Columbia Television Co.
601 E. Tremont Ave.
New York 57, N. Y.

Cornell Television, Inc.
385 Flatbush Ave., Ext.
Brooklyn 1, N. Y.

Coronet Radio & Television Corp.
500 W. 52nd St.
New York 19, N. Y.

Cortley Television Co.
15 W. 27th St.
New York 1, N. Y.

Cosmo Electronics Corp.
675 Hudson St.
New York 14, N. Y.

Crosley Div., AVCO Mfg. Corp.
1329 Arlington St.
Cincinnati 25, Ohio

DeWald Radio Mfg. Corp.
15-15 37th Ave.
Long Island City, N. Y.

Du Mont Laboratories Inc., Allen B.
2 Main Ave. 515 Madison Ave.
Passaic, N. J. New York, N. Y.

Duval Radio & Television Corp.
423 Grove St.
Jersey City 2, N. J.

Electronic Creations Co., Inc.
367 Greenwich St.
New York 13, N. Y.

Electro Technical Industries
1412 N. Broad St.
Philadelphia 21, Pa.

Emerson Radio & Phonograph Corp.
111 Eighth Ave.
New York 11, N. Y.

Espey Mfg. Co.
528 E. 72nd St.
New York 21, N. Y.

Fada Radio & Electric Co.
525 Main St.
Belleville, N. J.

Farnsworth Television & Radio Corp.
1700 S. Pontiac St.
Fort Wayne 1, Ind.

Federal Telephone & Radio Corp.
100 Kingsland Rd.
Clifton, N. J.

Federal Television Corp.
210 E. 9th St.
New York 3, N. Y.

Fisher Radio Corp.
41 E. 47th St.
New York 17, N. Y.

Fiske Products, Inc.
12 Maple Ave.
Mt. Kisco, N. Y.

Freed Radio Corp.
200 Hudson St.
New York 13, N. Y.

Garod Electronics Corp.
70 Washington St.
Brooklyn 1, N. Y.

General Electric Co.
Electronics Park
Syracuse 1, N. Y.

Gillfillan Bros., Inc.
1815 Venice Blvd.
Los Angeles 6, California

Globe Electronics, Inc.
225 W. 17th St.
New York 11, N. Y.

Gott Radio Mfg. Co.
6517 West Blvd.
Inglewood, Calif.

The Hallicrafters Co.
4401 W. 5th Ave.
Chicago 24, Ill.

Hoffman Radio Corp.
3761 S. Hill St.
Los Angeles 7, Calif.

Hollywood Electronics
7460 Melrose Ave.
Los Angeles, Calif.

Howard Radio Co.
1735 Belmont Ave.
Chicago 13, Ill.

Industrial Television, Inc.
359 Lexington Ave.
Clifton, N. J.

International Television Corp.
745 5th Ave.
New York 22, N. Y.

Jamaica Radio Television Mfg. Co.
148-18 Jamaica Ave.
Jamaica 2, N. Y.

Jewel Radio Corp.
581 Ave. of Americas
New York 11, N. Y.

Kinsey Radio Mfg. Co.
5807 Oak St.
Omaha 6, Nebr.

LaMagna Mfg. Co., Inc.
51 Clinton Pl.
E. Rutherford, N. J.

Lytle & Canon
4721 N. Kedzie
Chicago 25, Ill.

Magnavision Co.
3605 Kingsbridge Ave.
Bronx 63, N. Y.

Magnavision, Inc.
1546 2nd Ave.
New York 28, N. Y.

The Magnavox Co.
2131 Beuter Road
Fort Wayne 4, Ind.

Maguire Industries, Inc.
936 N. Michigan Ave.
Chicago 11, Ill.

Majestic Radio & Television Corp.
900 N. State St.
Elgin, Ill.

Major Television Co.
2500 David Stott Building
Detroit 26, Michigan

Mars Television, Inc.
29-05 40th Road
Long Island City 1, N. Y.

Midwest Radio & Television Corp.
909 Broadway
Cincinnati 2, Ohio

Motorola, Inc.
4545 Augusta Blvd.
Chicago 51, Ill.

MP Concert Installations
Fairfield 10, Conn.

Multiple Television Mfg. Co.
957 Hegeman Ave.
Brooklyn 8, N. Y.

Nalpak Products, Inc.
152 E. 32nd St.
New York 16, N. Y.

National Co., Inc.
617 Sherman St.
Malden 48, Mass.

National Polytronics, Inc.
2430 Atlantic Ave.
Brooklyn, N. Y.

New England Television Co.
544 E. 6th St.
New York 9, N. Y.

Nielsen Television Corp.
Newton Ave. at Crawford Rd.
Norwalk, Conn.

Nobell Mfg. Co.
517 W. 47th St.
New York 19, N. Y.

Noblitt-Sparks Industries, Inc.
Columbus, Indiana

North American Philips Co., Inc.
100 E. 42nd St.
New York 17, N. Y.

Olympic Radio & Television, Inc.
1401-19 38th Ave.
Long Island City, New York

Orthon Corp.
196 Albion Ave.
Paterson 2, N. J.

Packard-Bell Co.
1443 Wilshire Blvd.
Los Angeles 5, Calif.

Philco Corp.
Tinga & C Sts.
Philadelphia 34, Pa.

Philharmonic Radio Corp.
119 W. 57th St.
New York 19, N. Y.

Pilot Radio Corp.
37-06 36th St.
Long Island City 1, N. Y.

Pioneer Television Co., Inc.
282 W. 25th St.
New York 1, N. Y.

Radio Corp. of America
RCA Victor Div.
Camden, N. J.

Radio Craftsmen, Inc.
1341 S. Michigan Blvd.
Chicago, Ill.

Regal Electronics Corp.
603 W. 130 St.
New York 27, N. Y.

Remington Radio Corp.
80 Main St.
White Plains, N. Y.

Remler Co., Ltd.
2101 Bryant St.
San Francisco 10, Calif.

RGH Mfg. Corp.
365 Canal St.
New York 13, N. Y.

Royal Television & Radio Corp.
81 Willoughby St.
Brooklyn, N. Y.

Scott Radio Laboratories
4541 Ravenswood Ave.
Chicago 40, Illinois

Sentinel Radio Corp.
2100 Dempster St.
Evanston, Ill.

Shevers, Inc., Harold
33 West 46th St.
New York 19, N. Y.

Sightmaster Corp.
385 North Ave. 220 5th Ave.
New Rochelle, N. Y. New York 1, N. Y.

Slate & Co.
2553 Webster Ave.
Bronx 58, N. Y.

Smucker & Co., Inc., A. F.
338 E. 23rd St.
New York 10, N. Y.

Sonora Radio & Television Corp.
325 N. Hoyne Ave.
Chicago 12, Ill.

Sparks Withington Co., The
2400 E. Michigan Ave.
Jackson, Michigan

Standard Radio & Television
209 Main St.
Fort Lee, N. J.

Starrett Television Mfg. Corp.
601 W. 26th St.
New York, N. Y.

Stewart-Warner Corp.
1826 Diversey Parkway
Chicago 14, Ill.

Stromberg-Carlson Co.
100 Carlson Rd.
Rochester 3, N. Y.

Symphonic Radio & Television Corp.
230 S. Spring St.
Los Angeles 12, California

Tech-Master Products Co.
121 Prince St.
New York 12, N. Y.

Telecraft Corp.
2 W. 15th St.
New York 11, N. Y.

Tele King Television Corp.
601 W. 26th St.
New York 1, N. Y.

Telequip Radio Co.
1901 S. Washtenaw Ave.
Chicago 8, Ill.

Telesonic Corp. of America
212 Concord St. 2 Prince St.
Brooklyn, N. Y. Brooklyn, N. Y.

Tele-Tone Radio Corp.
540 W. 58th St.
New York 19, N. Y.

Television Assembly Co.
540 Bushwick Ave.
Brooklyn 6, N. Y.

Television Development Labs., Inc.
252 W. 64th St.
New York 23, N. Y.

Television Industries
Brooklyn, N. Y.

Television Laboratories, Inc.
542 N. Parkside Ave.
Chicago 44, Ill.

Televista Corp. of America
114 E. 16th St.
New York 3, N. Y.

Televue Corp. of America
139 Laurel Ave.
Lakewood, N. J.

Telcor Corp.
351 Madison Ave.
New York 17, N. Y.

Telindustries Inc.
4921 Exposition Bldg.
Los Angeles, Calif.

Templetone Radio Mfg. Corp.
New London, Conn.

Tradio, Inc.
1001 First Ave.
Asbury Park, N. J.

Transvision, Inc.
460 North Ave.
New Rochelle, N. Y.

U. S. Television Mfg. Corp.
3 W. 61st St.
New York 23, N. Y.

Universal Television Co., Inc.
147 Montague St.
Brooklyn 2, N. Y.

Video Corporation of America
229 W. 28th St.
New York 1, N. Y.

Vid-craft Corp.
New York, N. Y.

Watterson Radio Mfg. Corp.
2700 Swiss Ave.
Dallas 1, Texas

Wells-Gardner & Co.
2701 N. Kildare Ave.
Chicago 39, Ill.

Westinghouse Electric Corp.
1354 Susquehanna Ave.
Sunbury, Pa.

Wilcox Gay Corp.
Charlotte, Michigan

Zenith Radio Corp
6001 Dickens Ave.
Chicago 39, Ill.

Television

PROJECTION SYSTEMS



RCA's Model 648 PTK large-screen television receiver which gives a 15"x20" picture.

By M. S. KAY

Current developments in projection TV makes possible large images from relatively compact television sets.

THE desire for relatively large television pictures is a natural one. One immediate advantage is the ability to view the screen for long consecutive periods without fatigue. Secondly, a greater number of persons can more comfortably view a large area than say a 7- or 10-inch screen. This is particularly desirable in sets installed in public places, such as auditoriums, taverns, theaters, and retail establishments.

Large images can be obtained in two ways: by using cathode-ray tubes having large viewing surfaces, or by projection. In the first method, practical considerations limit the screen to diameters of 20 inches. A tube having a diameter of 20 inches possesses a large physical volume, is awkward to manipulate, and expensive.

Difficulties with these tubes are encountered at all points. In manufacture, the machines required for evacuating and sealing must be considerable in size. This either results in a limited production or a large capital investment. The large bulk of the tube increases the storage and transportation costs to an amount far beyond a proportionate value for a smaller tube. Finally, in the home, the cabinet, which is no minor item in the final pricing of the set, must likewise be large. Because of these difficulties, tubes with screens greater than 20 inches have not been commercially attempted. Sets using viewing tubes with 12, 15, or 20-inch screens are readily available, however.

The other approach to large screen television is by projection and to date

two general systems have been employed. In one method, the image is formed on the screen of a small cathode-ray tube and then enlarged, using several projection lenses similar to those employed in motion-picture equipment. The chief disadvantage of this method is its low efficiency. Specially treated lenses, having a large aperture and good transmission of light, deliver to the viewing screen only about 6 per-cent of the light available on the screen of the cathode-ray tube. Consequently, even with intense images developed on the cathode-ray screen, the final image is bound to be dim and difficult to see.

As an illustration, consider the 5-inch projection tube, with its image of 3" x 4". The total area here is 12 square inches. If the image is enlarged to fill a screen 15 x 20 inches, the total area becomes 300 square inches, and the light which was originally concentrated in an area of 12 square inches is now spread out to cover an area of 300 square inches. The brightness is thereby reduced by the ratio of 300/12 or 25 to 1. This is, of course, assuming 100 per-cent transmission. If now we take into ac-

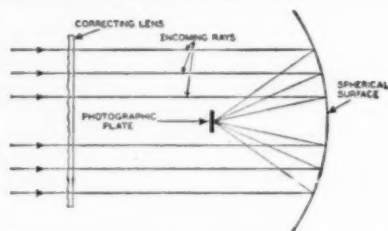


Fig. 1. Original Schmidt optical system as designed for astronomical telescopes.

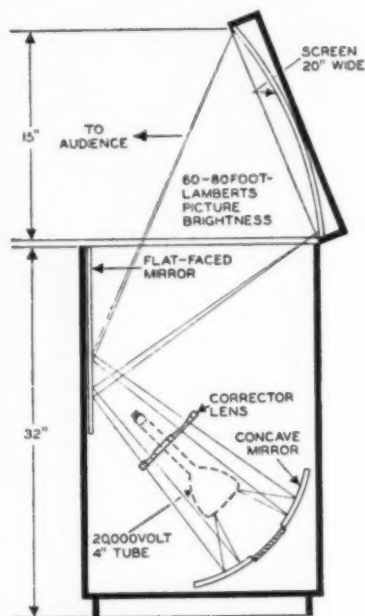
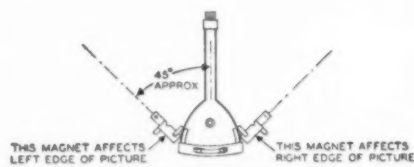


Fig. 3. The Philco projection system.



count that the over-all efficiency is only 6 per-cent, then the brightness is decreased by a factor of approximately 400 to 1 rather than 25 to 1.

Increasing the brightness of the image developed on the tube screen would be one partial solution to this problem, but the cost involved can readily place the equipment in the same expensive class as large cathode-

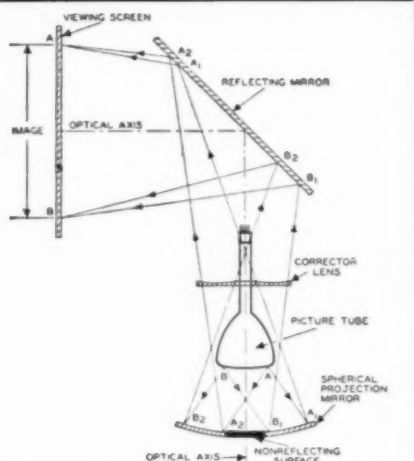


Fig. 2. The Schmidt system as adapted by G.E. and RCA for their television sets.

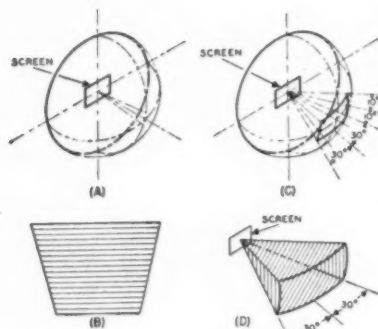


Fig. 4. (A) A non-directional screen will produce equal illumination at all equidistant points throughout a hemisphere. (B) A trapezoid. (C and D) The directional characteristics of Philco viewing screen.

Fig. 5. To produce a trapezoidal image on the CRT face, the magnets are attached to the tube as indicated in the drawing.

ray tubes. A second approach to the problem, and one which appears to have greater possibilities, is to increase the efficiency of the lens system.

The first attempt in this direction was tried with the same lenses mentioned above and several difficulties were immediately encountered. In order to capture as much light as possible being emitted from the screen, the

projection lens should be as large as possible. However, as the lens becomes larger, the number of distortions or "aberrations" multiply. (There are principally six aberrations that must be corrected; namely, chromatic aberration, spherical aberration, coma, astigmatism, curvature of field, and distortion.) To correct for these aberrations in a fairly satisfactory manner, we require several lens elements, say possibly three. However, in a wide angle system, more than three lens elements should be used. As more elements are added, the cost of the system rises. The greater the number of lenses in a system, the greater the total loss of light at the intersecting surfaces and the lower the over-all efficiency. Finally, with large lenses, the elimination of some aberrations is accompanied by a greater accentuation in others.

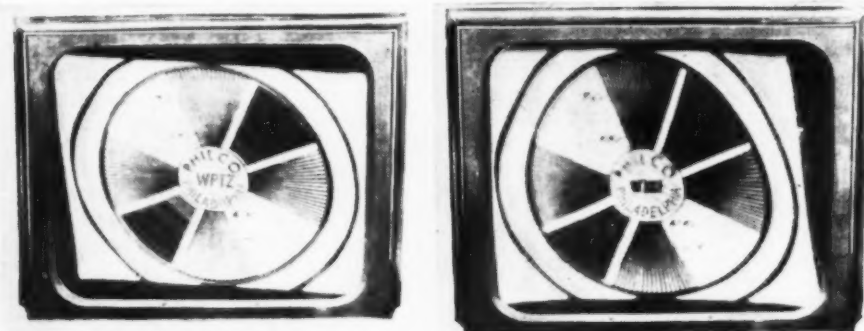
This was the impasse that faced television engineers until the adaptation of the Schmidt reflective optical system to television. Schmidt, an instrument maker at the Hamburg Germany Observatory, invented his optical system in 1931. The system, originally designed for astronomical telescopes, was built around a large spherical reflecting surface or mirror. See Fig. 1. Use of this type of reflecting surface offered several immediate advantages:

1. Mirrors are completely free of chromatic aberrations.
2. Under comparable designs of focal distance and diameter, a spherical mirror has a spherical aberration one-eighth that of a single lens. The need for correction is still present, but the problem is now considerably simplified.
3. By placing a small aperture or opening at the center of curvature of a spherical mirror, all of the monochromatic aberrations (except spherical aberration) are eliminated.

We are thus left with essentially two problems to solve. One is spherical aberration and the other is curvature of the field. The latter is quite simply resolved by curving the screen of the projection tube to suit the curvature of the mirror. To eliminate spherical aberration, a special correcting lens is employed. The correcting lens introduces into the beam an amount of spherical aberration which is equal to that introduced by the mirror, but is opposite in sign. As a result, the two neutralize each other, effectively removing the last great defect of the spherical mirror. With this lens in place, we have an optical system possessing an efficiency of 25 per-cent with magnification of 5. Compare this to the meager 6 per-cent obtainable using a refractive lens system.

For use in television receivers, there are several modifications of the original Schmidt lens system as designed for astronomical use. In RCA and G.E. projection receivers, the optical mirror is mounted at the bottom of the cabinet with its axis vertical, project-

Fig. 6. The visual effect of improper adjustment of the fixed magnets of Fig. 5.



ing the image straight up and onto a flat mirror inclined at 45 degrees to the beam of light and throwing the image on a translucent screen. See Fig. 2. The throw or distance between the correcting lens and the viewing screen will depend upon the diameter of the correcting lens and the spherical mirror. To increase the size of the projected image, the distance or throw must increase, necessitating large cabinets, a larger mirror, and a larger correcting lens. Eventually the optical system becomes awkward and bulky. A compromise is thus necessary between the size of the final image and the cost and size of the set. For each different throw or magnification, we require a different correcting lens. This, it will be noted, differs from a refractive lens system where the size of the projected image can be increased merely by changing the position of the lenses and the screen.

In Philco projection television receivers the arrangement of the optical system components is slightly different as shown in Fig. 3. The distance between the corrector lens and the screen is $33\frac{1}{2}$ inches and variations of plus or minus 10 per-cent are permissible without leading to any serious deterioration of image quality. Each of the reflecting plane mirrors in all these optical systems are front-surfaced mirrors to prevent ghosts which would occur from reflections at the surface of the glass of a rear-surfaced mirror.

The translucent screen upon which the final image is projected has, in itself, directional properties which concentrate the incoming beam in certain desired directions. If the screen was a perfect diffuser of light, it would produce illumination which was equally visible all over the room. Graphically this could be shown as indicated in Fig. 4A. At all points throughout a hemisphere, whose center coincides with the screen, equal illumination would be received from the screen. Since many of the extreme angles of this hemisphere are never (or very seldom) used for viewing, due to foreshortening, it is advantageous to concentrate the light that would normally go to these points toward those angles that are most used for viewing. To achieve this, the translucent screen is made directional in the vertical and horizontal directions. Not only does this cause the final image to be brighter than it would be using the perfect diffuser screen, but it also presents the added advantage of greatly reducing the susceptibility of the screen to any stray light from lamps located in the viewing room.

In the Philco projection receiver, the screen is designed to have a viewing sector which extends 60° horizontally and 20° vertically. See Fig. 4B. To achieve this directivity, the screen contains a large number of vertical grooves, random shaped. These vertical grooves are responsible for the horizontal directivity of the screen. To achieve the 20° vertical directivity,

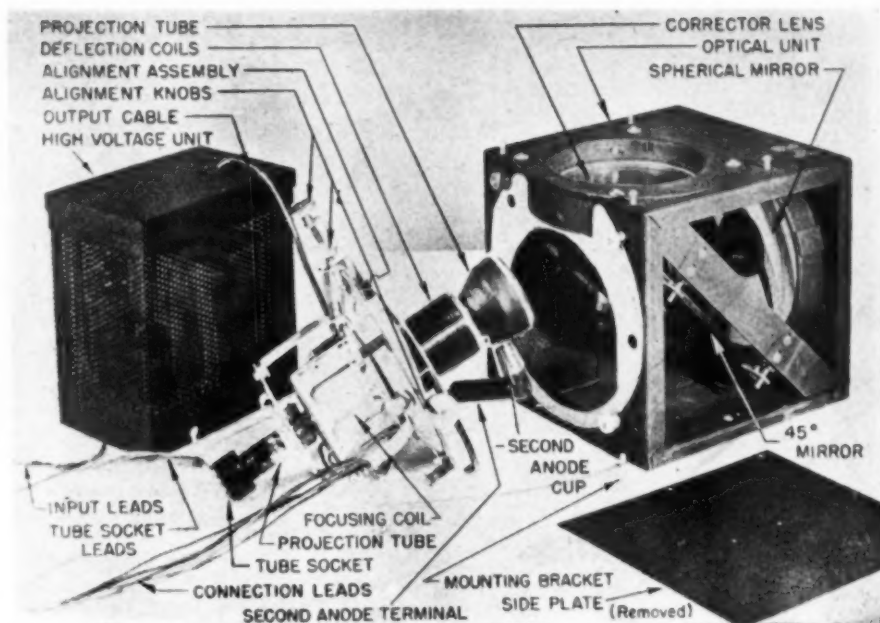


Fig. 7. The entire assembly, including the special power supply, as used in the North American Philips projection television system.

the screen surface is made concave. See Fig. 3. The screen, in addition to its directional properties, also possesses a great many minute or lenticular elements, each of which redistributes or diffuses the light reaching it uniformly throughout the desired sector. The over-all brightness of this screen is about 50 foot-lamberts.

Since the optical system is mounted at an angle and projects on the screen at an angle, a rectangular image projected from the face of the picture tube would appear on the screen as a trapezoid (the image would have sloping sides with the top larger than the bottom). See Fig. 4B. On the other hand, by projecting a trapezoidal image from the tube, we obtain a rectangular image on the screen. This latter method is the one used in the Philco system.

Formation of the trapezoid pattern is achieved by applying a magnetic field at right angles to the electron beam. To produce this magnetic field, two oppositely polarized permanent magnets are mounted opposite each other on the end of the projection tube. See Fig. 5. An iron pole piece, curved to fit the sides of the tube, is attached to each magnet and is used to produce a strong field for deflecting the electron beam upward near the tube face. The oppositely polarized ends of the magnets farthest from the tube face cause a lesser and downward deflection of the beam before it is deflected upward. The result is the same as that which would be produced if the face of the tube were tilted inward; the distance the beam travels to the bottom of the image is reduced and the distance to the top is increased. This creates the desired trapezoidal pattern. The magnets are adjusted for the proper keystone pattern by moving them toward (parallel to the

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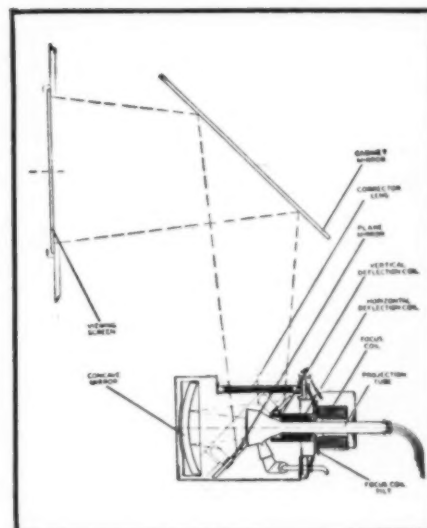
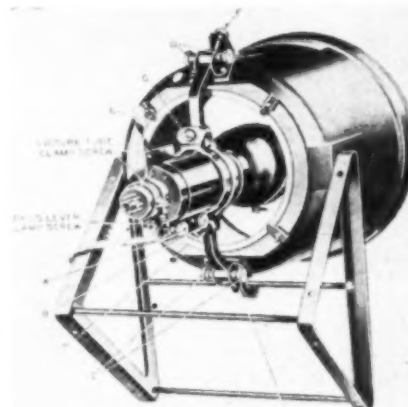
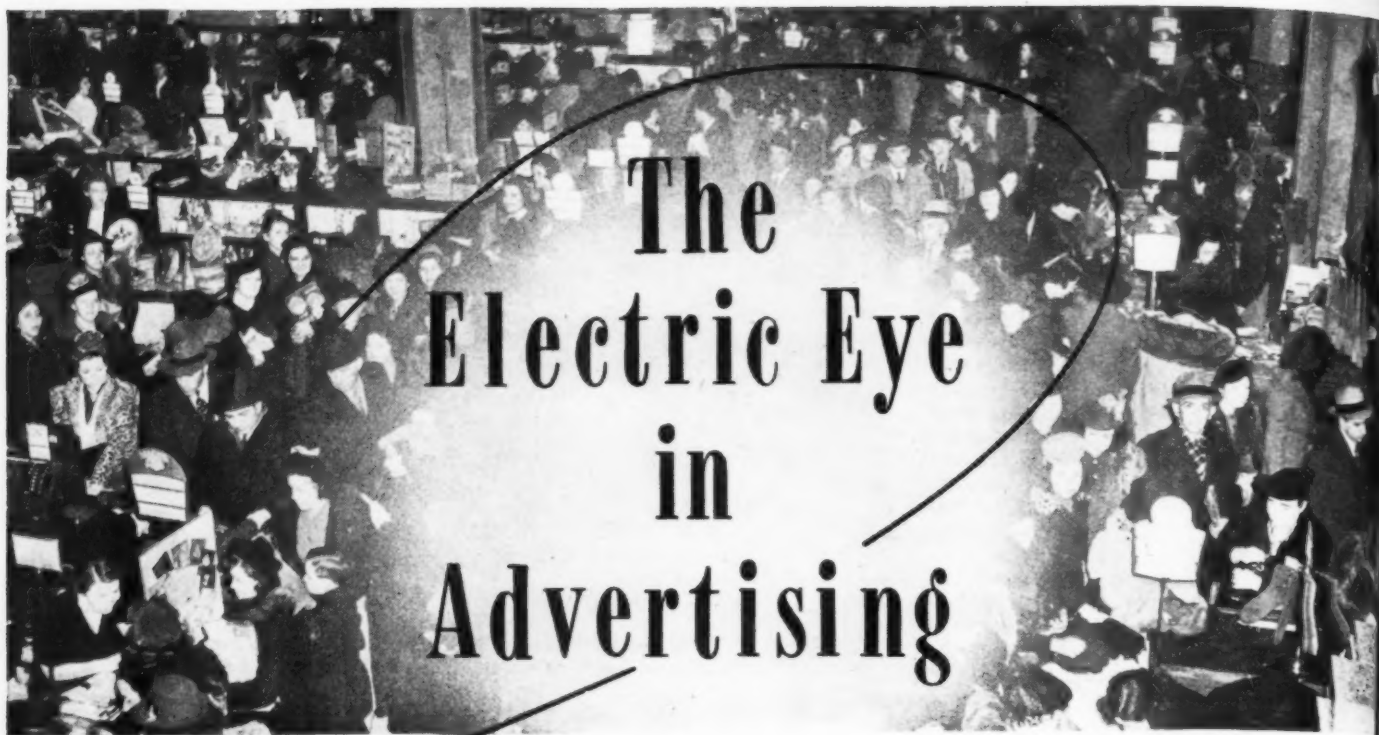


Fig. 8. The various components of the optical unit of the Philips projection set.



Fig. 9. The "optical barrel" in Philco and RCA receivers. The points lettered A through H are physical positioning adjustments.





The Electric Eye in Advertising

By
A. EDELMAN

A real sales promoter—the "electric eye" incorporated in novel gadgets will attract the interest of potential customers.

MOST of our collective electrically-disposed brains are so engrossed with radio, recordings, television, and other forms of communications electronics that we tend to overlook the amazingly varied jobs handled by the workaday electric eye relay, or photorelay. I would like to tell you about some of those jobs, and how my friend Xavier made them his source of income.

When I first met Xavier he was a thin, thoughtful, seedy-looking soldering-iron mechanic not long out of the Army and its unfailing three squares daily. He entered my office to borrow a photorelay, a man with small resources, a wife in prospect, and big ideas. Now, months later, he has invited me to bring you readers along on a visit in the neighborhood, to see how he has applied the electric eye to good use in advertising.

Following Xavier's instructions, we arrive at the Roebuck Hurn department store at dusk, just in time to see their big neon signs light up, more or less at the same time. Xavier has told me how he placed photorelays in some of the upper story windows, pointed towards the sky; and how, when the sky darkens, sufficiently, these relays turn the signs on. Each photorelay operates one or two neon signs.

I remember vividly the trouble he had with the first of these units; he

had placed it right near the sign it was to control, but inside the window. When it became dark that first day, the sign went on, and its light reached into the phototube, so that the phototube promptly turned off the sign. This went on quite merrily, until the contactor overheated, and someone called the store electrician. After that, the electrician had to be pacified with the gift of one of our photorelay kits for his high school age son. The sign control was adjusted by making sure that the sign could not shine into the phototube, and also by putting in a time-delay circuit so that it would take ten or fifteen seconds to turn the sign either on or off. That was to fool the clerks who started showing their friends how they could turn the sign on by placing their hands over the electric eye light entrance. By permission, I am passing along the circuit details to you, on the chance you may want to use it sometime. It's all in the diagram of Fig. 1 and the explanation below the diagram.

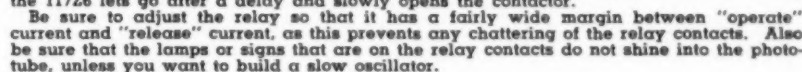
Well, now we are at the store, and there are the show-windows with all their displays. Xavier asked me to watch out for the second window, and to walk by after it was cleared of people, so that we could see just what happens. We do that, and notice the spotlight shining at us, and the phototube box near it picking up the light reflected from our clothes. Xavier ex-

plained to me sometime back how a disturbance to the amount of reflected light entering the phototube was amplified as an a.c. signal, and how this caused a relay to operate. This circuit, with its voltage regulators, high gain amplifier, bandpass filter, resistance-capacity coupling, and time-delay arrangements, is too complicated to explain here, so I won't try. But it certainly does work fine, because as we pass by, the window seems to come to life. A fast-flashing lamp somewhere in the window dazzles, and cannot be ignored; it is almost hypnotic. We go to the window, of course, and are able to see how Xavier laid out all of the electrical stuff without taking any room away from the pajamas and blankets. Judging by the crowds that follow us, a lot of people are going to know all about those pajamas soon.

That fast-flashing lamp, by the way, is another piece of photorelay work, and is something like the sign control that didn't work correctly, which I just described. The photorelay controls the big lamp, and when the lamp goes on, the light from it reaches into the phototube, and causes the relay in there to turn the lamp off. When the lamp is off, the darkness at the phototube causes it to switch on again. The effect is better when the lamp does not switch on and off too fast, and so the phototube is adjusted to require

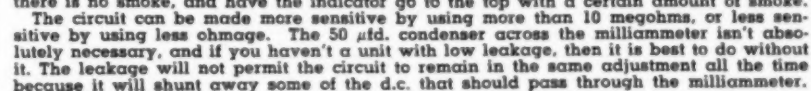
Now we are at phonograph records, and there is a crowd of people around a sign that says "*Talk over the Light Beam—Free.*" There are two reflectors, one at each end of the space, and a man at one end is talking to a lady at the other, using telephones. The small boy in the middle is up to something—he lifts that umbrella into the light beam and annoys the talkers by cutting them off. Perhaps we should tell Xavier to raise the reflectors; but then, maybe not, because after all, the

May, 1949



That light-beam job is just like a crystal microphone preamplifier. The phototube is in series with a 5 megohm resistor, and with a 90 volt battery, and the resistor is coupled through a condenser into a standard audio amplifier. The output is coupled to a ¼ watt neon lamp through a trans-

(Continued on page 148)



Mac's RADIO SERVICE SHOP

By JOHN T. FRYE



Mac and the Morning Mail

BARNEY was busy at the service bench putting a new volume control in an a.c.-d.c. midget, while behind him the boss-man himself was making some adjustments on a TV console. The bright May-morning sunshine flooding through the big plate glass windows of the front room seemed to dim the usual brilliance of the fluorescent-lighted service department.

What Mac was really doing was adjusting the ion-trap on the neck of the 10BP4 picture tube, and to do this he was making use of his latest "invention." This invention—which Barney had solemnly dubbed the *Reflectomagnovisor*—was nothing more than one of those swivel-mounted, reversible shaving mirrors with a plain mirror on one side and a magnifying mirror on the other, mounted on a folding music stand. The mirror was mounted in place of the original music rack, so it could be adjusted to any height and turned and tilted through any angle. This portable device permitted Mac to stand behind a TV set and to see a reflection of the pattern on the face of the tube while making the adjustments usually controlled from the rear of the set. He could have his choice of a wide-angle, undistorted view of the whole tube face or a highly-magnified reflection of a particular portion of that screen—a selection that came in very handy when working with the *linearity*, *drive*, and *focus* controls.

As Mac decided that he had the trap at the exact spot and in the best possible position on the neck of the tube for maximum brilliance of the raster, Miss Perkins brought in the morning mail and thumped it down on top of the receiver.

"For once," she remarked acidly,

"you actually have a first-class letter or so in that mess."

Miss Perkins had a very low opinion of the flood of catalogs, circulars, technical bulletins, and advertising postcards that made up the bulk of the radio shop mail. Mac sat down on the end of the service bench and began to gouge open the envelopes with the long slender blade of a dialknob screwdriver.

"Hey, Red," he said as he waved the first letter about, "do you remember my telling you about those 35Z5's, 35Z3's, etc., that develop a funny condition so that the smallest jar will cause them to make a noise? Well, I wrote to this tube manufacturer and asked if he could tell me why they did this. He said to send him some samples of the noisy tubes, and I did. In this letter he says that an inspection reveals that under certain conditions some of these tubes develop a condition wherein they actually generate r.f. pulses when they are jarred ever so slightly. These pulses are picked up by the antenna and are amplified by the set. He remarks—as we found out, too—that the noise is worse in those sets in which a built-in loop is quite near the rectifier. He suggests that putting a shield around the rectifier tube will help reduce the noise."

"Do we start shielding those noisy tubes or do we continue to replace them as we have been doing?" Barney wanted to know.

"I think that in most cases we will continue replacing the tubes," Mac said after a little reflection. "A 35Z5 usually has a short life anyway, and if we cut off its ventilation by putting a shield around it, the set would probably be back in a few days with a burned-out rectifier; then we would

have to put in the new tube that we might just as well have put in in the first place."

Having made this decision, Mac laid aside the letter and butchered open another envelope with his screwdriver. "Well, well," he muttered as he glanced over the page, "we seem to have hit the jackpot today. This letter takes up another of our problems. I have always wondered exactly what happens to those electrolytic condensers that become noisy without developing either an open or a shorted condition. You know—the ones that make a static-like noise until you bridge a good condenser across them; and then the noise stops, only to start up again a few minutes later.

"Well, I saved up a few of these that we had taken out of sets and sent them in to this condenser manufacturer. Some were his; others were of competitive makes. This letter says that the chief engineer of the company inspected the condensers and found that in every case there were very small variations in the contact resistance of the leads. In certain critical circuits, these variations would cause noise. He goes on to say that these variable resistances, tiny though they were, have now been eliminated in their own products."

"What do you suppose he means by 'certain critical circuits?'" Barney wanted to know.

"I think he means circuits in which an abrupt change of voltage, even though it is slight, would produce a sort of r.f. pulse. We know that the noise is of an r.f. nature, for when one of these noisy sets is playing on the bench, you can pick up the noise on other sets operating nearby; moreover, when the volume control is turned down so that an r.f. signal cannot be detected and fed through into the audio amplifier, the noise disappears. Possibly the little abrupt changes of voltage due to the variations in the contact resistance pulse-modulates the oscillator in the set and produces a noise in much the same way that a keyed oscillator or r.f. amplifier produces key clicks."

Barney nodded sagely in agreement with this and went on with his work while Mac continued reading still a third letter.

"Hey, Mac," Barney suddenly interrupted, "what's the idea of this coil of insulated wire wrapped around this 2 μ fd. condenser? The circuit diagram shows the coil and condenser in series between the 'B-minus' point and the chassis, and then there's a quarter-meg resistor across the whole works."

"What does it look like?" Mac asked quizzically.

"It looks like a series-tuned circuit," Barney said cautiously.

"And by a happy coincidence, that's exactly what it is!" Mac said.

"Well, come on!" Barney said impatiently. "Tell me more! What's a tuned circuit doing in that out-of-the-way place? Why use it instead of the usual condenser-and-resistor combina-

(Continued on page 158)

RADIO & TELEVISION NEWS

Broadcasting Station on Wheels



When a news story breaks in Oklahoma, WKY is on the spot with instant coverage—thanks to a complete and unique studio which travels to the story locale.

COMplete communication facilities for use in emergencies, and as a showpiece for more normal remote broadcasts are housed in the custombuilt "broadcasting station on wheels" now roaming the plains of Oklahoma for WKY, the NBC affiliate in Oklahoma City.

A study of special events programming in Oklahoma by P. A. Sugg, station manager, revealed the need of more versatile facilities for such work. As a result, a new and completely equipped remote studio was created. The 29 passenger bus was custom-built by *Flexible Company* at their Loudonville, Ohio plant, following specifications carefully detailed by the WKY engineering department.

Immediately behind the driver are seats for announcers, engineers, and others on special assignment. The center section contains the control room where all equipment a studio requires is shock mounted, enabling the unit to operate while in motion.

Included in the control room are four AM-FM cue and talkback receivers, a 150 watt AM transmitter and two turntables with recorders adjustable to bus position, plus record storage and seating space.

The back third of the unit is a maroon and gray appointed studio, sound treated and large enough to accommodate nine people. There are two Pullman-type tables for broadcasting, four microphone outlets and seats for five across the back.

The luggage compartment contains a 2 kw. gasoline power plant, a 50 w. public address system, a *Bell* telephone transmitter and receiver and an FM police receiver.

Sound power phones are used for communication within the unit and a *Bell* highway telephone provides com-

munication with established circuits throughout the state of Oklahoma.

This equipment has already proved its value. For example, the remote studio was parked on the campus of the University of Oklahoma, 20 miles south of Oklahoma City recently, where a program was scheduled for that afternoon. Word of a disastrous fire at Woodward, 150 miles northwest of Oklahoma City, was relayed to the vehicle by the *Bell* highway telephone. Plans were quickly changed, the remote studio pulled out for Woodward, further instructions were given by telephone as the vehicle sped along the highways, and in less than three hours an eye-witness broadcast was on the air from Woodward.

A railed platform atop the remote

studio provides an unobstructed view for on-the-scene broadcasts. AM-FM transmitting and receiving antennas are also located along the top of the vehicle.

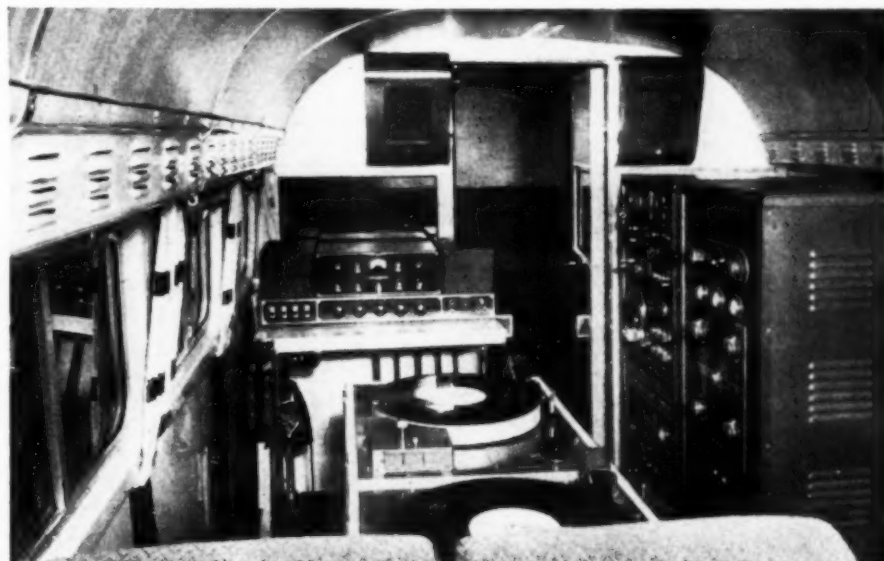
Power outlets, microphone and telephone line inputs were installed outside the unit, along the body frame supports.

Accessories such as fog lights, siren, spotlights and public address speakers add the final touch.

Jack Lovell, chief engineer, Gene Lyons, field supervisor, Ed Callahan, engineering supervisor, and Bob Hayward, engineer, worked steadily for nearly two months making the installations that make the remote studio one of the finest in America.

-30-

View of mobile control room showing transcription tables, console, highway-type telephone, sound power phone, speakers, AM and FM receivers, and AM transmitter.



A Briefcase HAM PORTABLE

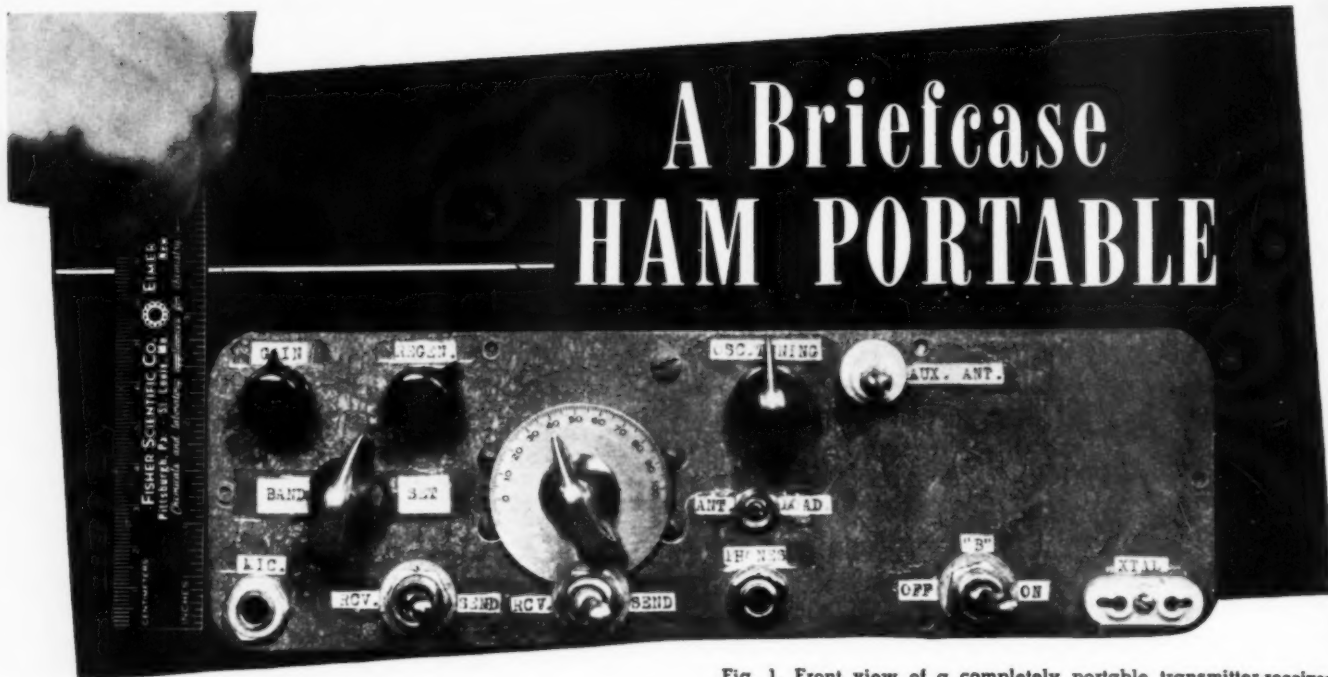


Fig. 1. Front view of a completely portable transmitter-receiver which provides either phone or c.w. operation in the lower bands.

By E. CAMPAINE, W3KWP and M. F. JUDKINS, W3AC

A standard briefcase or the glove compartment of a car will readily hold this tiny ham "station."

BRIEFCASE ham portable, portable mobile, vacation portable—call it what you will but this little combination transmitter-receiver represents the ultimate in compactness for two-way communication on both phone and c.w. for the low frequencies.

The urge to build some type of battery-operated equipment was fulfilled when surplus gear began to flood the market. The vital parts used in the construction of the rig are all from surplus items—parts that might have otherwise been discarded. Fig. 6 is a front view of the complete station including headphones, microphone, key, loading coil, and antenna. Fig. 5 is the rear view of the unit showing the

meter, key jack, and modulator-c.w. switch.

Portability Without a Truck

This equipment is really portable and readily fits a standard briefcase or the glove compartment of the average car. Fig. 1 is a front view of the cabinet. The ruler clearly indicates that the over-all height of the unit is scarcely three inches!

Many articles have been written about the so-called "vest pocket" transmitter but usually a bushel basket is required to hold the rest of the paraphernalia that normally goes to make up the complete station, i.e., the receiver, antenna, batteries, etc. The auxiliary equipment used with this

station includes a throw-out antenna, which when folded is less than 16 inches long and when jointed ten feet, six inches; an antenna loading coil, headphones, a key, a microphone, and a plug-in meter. Everything else is housed inside the case—even the batteries.

The Circuit

Fig. 4 shows the circuit as it finally evolved. It is a compromise between the ultimate in compactness and efficiency yet it provides absolute minimum "A" and "B" battery drain. Alternatives could have provided an r.f. stage ahead of the detector and a Pierce oscillator power amplifier transmitter but both "A" and "B" current drain would have been doubled.

Receiver Details

The receiver is conventional and uses a 1T4 amplifier tube as a regenerative detector impedance-coupled to the 1S4 audio. Bias for the 1S4 amplifier tube is provided by three penlight cells which are cemented to the under-

Fig. 2. Top view of the transmitter-receiver unit showing the location of the coils, battery, and other top-chassis parts.

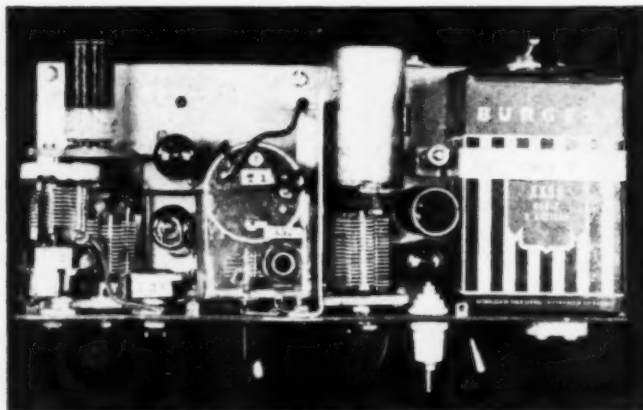
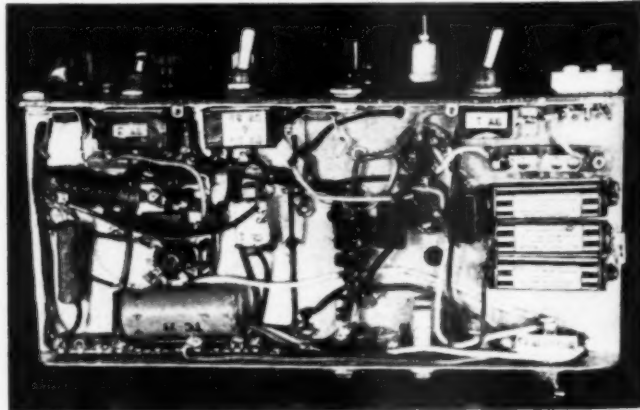


Fig. 3. Under chassis view of portable. Note that although the set is compact there is no undue crowding of the components.



side of the chassis. Since no current is drawn by these batteries their life can be considered that of shelf-life batteries. When using phone the 1T4 detector becomes the speech amplifier by switching the microphone into its grid circuit, and the 1S4 audio tube choke-modulates the screen grid of the 1S4 oscillator tube. The output transformer was salvaged from a surplus BC 453A. It serves as an output transformer when receiving, while the primary alone is used as the modulation choke. Because the headphones remain in the circuit at all times, complete monitoring of voice transmissions is possible.

As can be seen in Fig. 1, the 140 μ fd. bandset condenser, C_5 , is mounted on the left side of the front panel, the gain control, R_3 , is in the upper left-hand corner, and to the right of gain control is the regeneration control, R_1 . The plug-in coils, L_1, L_2 , which can be changed with the shield in place, and the antenna series condenser, C_1 , are mounted on a piece of lucite, bent into an angle and bolted to the chassis, as shown in Fig. 2. The 1T4 detector appears directly behind the regeneration control in Fig. 2 and farther back is the 1S4 audio tube. The output transformer, T_1 , is mounted to the right and is in the center of the chassis. Visible through the lucite angle bracket used to mount the antenna jack, J_3 , is the bandspread tuning condenser, C_4 . A vertical aluminum shield, bolted to the chassis and the front panel, separate the receiver and the transmitter.

The Transmitter

The transmitter is nothing more than a 1S4 crystal oscillator with a small feedback condenser to help some of your sluggish crystals perk up and take notice. The plate circuit is metered by a 0-25 ma. meter, through a closed-circuit jack, J_2 . The assumption that a simple pi-coupler will load any length of wire or anything from a wet string to a bed spring proved to be untenable. Designed to load the throw-out surplus antenna, this pi-coupler in conjunction with a loading coil can't miss, and no one can deny the reliability of the low impedance link when working the rig on the home antenna.

(Continued on page 120)

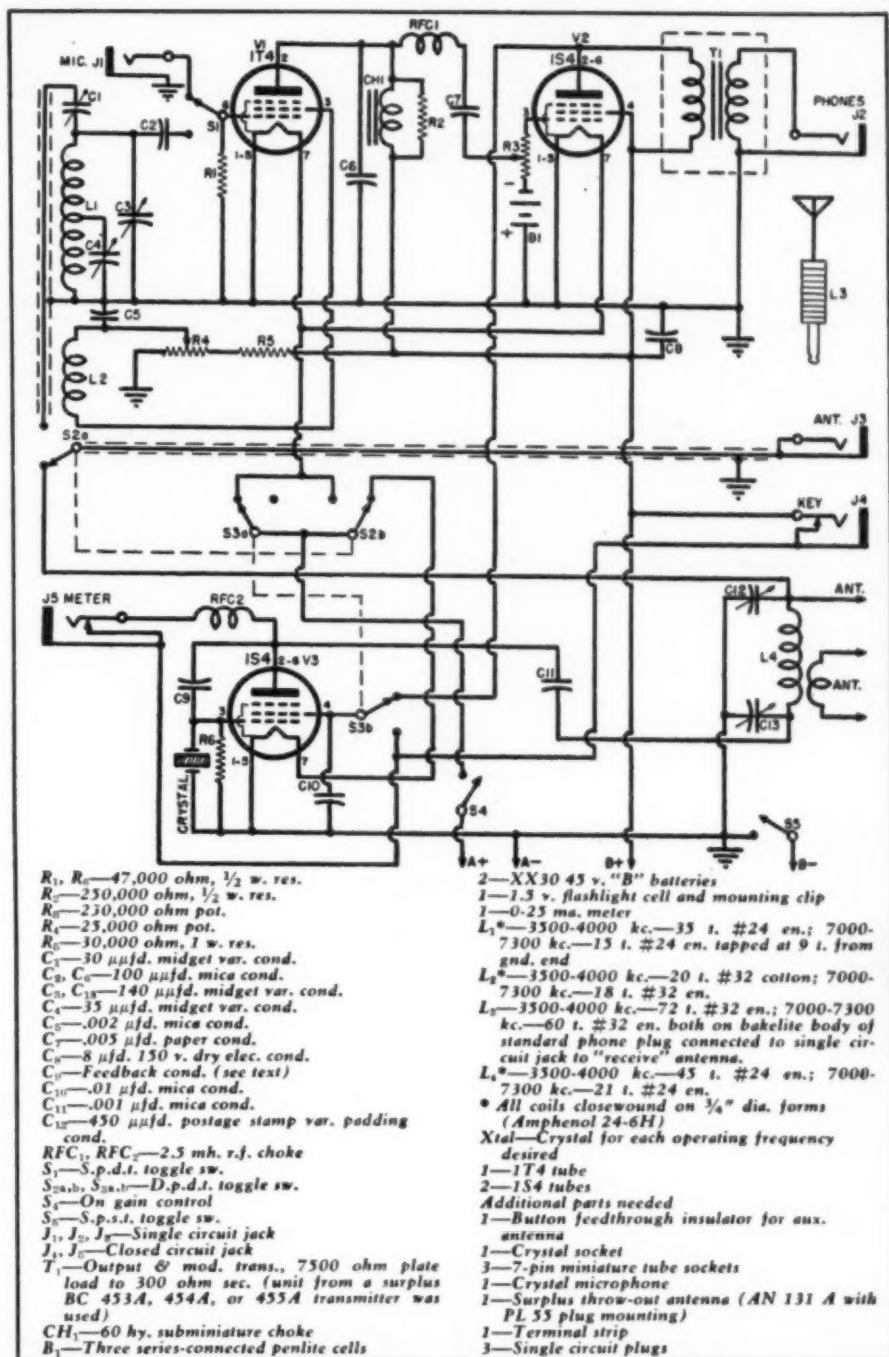


Fig. 4. Schematic diagram and parts list for the portable transmitter-receiver.

Fig. 5. Back view of unit showing plug-in milliammeter in place and the operating key inserted in the proper circuit jack, J_4 .

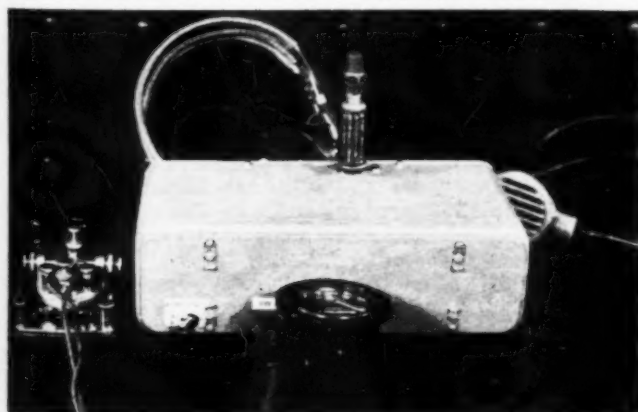
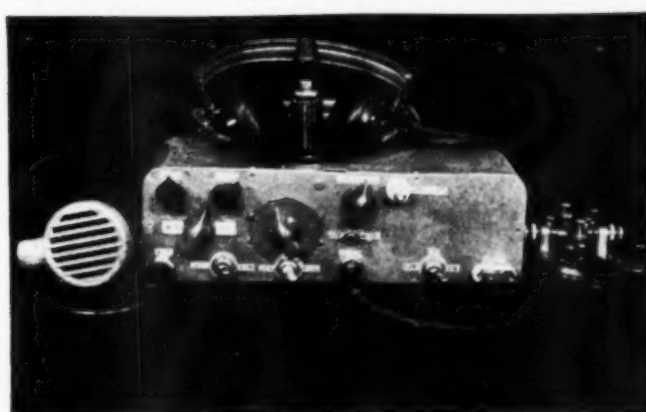


Fig. 6. Front view of unit with all of the operating accessories, headphones, mike, key, and throw-out antenna, assembled.



A Dual-Purpose Frequency Meter— V.F.O.

By
G. L. COUNTRYMAN,
WSHH, WIRVK

Commander, USN, Electronics Officer
Boston Naval Shipyard



Over-all view of completed unit. The v.f.o. output is adequate to drive an 807 tube either as a straight amplifier or as a frequency multiplier.

Complete construction details for a "ham" unit that can be used either as a v.f.o. to drive a transmitter or as a frequency meter for both receiver and transmitter frequency measurements.

THE basic unit to be described is similar to a v.f.o. designed by Don Mix about two years ago and written up in the 1948 *ARRL Handbook*. The main differences are the substitution of a mixer tube for one isolation stage, minor changes in the electron coupled oscillator components, and some refinements such as the inclusion of a dial that will read direct to 2500 divisions.

Provision is made for coaxial connection to the transmitter when the unit is used as a v.f.o., and for r.f. input and headphone output for the direct checking of a transmitter frequency or for monitor uses.

The v.f.o. output is adequate to drive an 807 tube either as a straight amplifier or as a frequency multiplier. No provision has been made for keying the unit so one or more of the following stages must be keyed, preferably in the cathode. A convenient switch in the center tap of the high voltage winding on the transformer cuts the v.f.o. on or off as desired.

Referring to the photographs, the dial on the 3" x 4" x 5" ECO box can be read directly to 2500 dial divisions in 180 degrees rotation. These dials sell new for around \$7.00 but are included with BC375E tuning units which currently retail on the surplus market for around \$1.25. The dial

shown was removed from one of the used surplus tuning units.

The left hand switch is in the a.c. line and the right hand switch is in the center tap of the high voltage winding of the power transformer. Between the switches is a 6.3 volt pilot light connected to the filament winding of the power transformer. The bulb is removable from the front of the chassis. A two-terminal strip (Millen No. 37302) is on the rear of the chassis for attaching the a.c. line cord, and on the right hand side of the chassis are the phone jack, the coaxial output terminal, and a binding post mounted on insulated grommets for coupling r.f. input, if necessary, in connection with the use of the unit as a frequency meter. A two or three-foot length of wire attached to this binding post provides sufficient input for checking even a low power transmitter, and insures adequate headphone volume.

Behind the ECO box are, left to right, the 6F6 isolation stage, the 6L7 mixer tube and an octal base plug-in 20-20 μ f. filter condenser obtained at surplus for 35 cents. The 6SK7 ECO tube is mounted on top of the ECO box where its heat will not affect the frequency or stability of the oscillator. Behind the filter condenser is the VR105 regulator tube and at the rear,

the rectifier tube. On the rectifier tube socket, pins 3 and 4, pins 5 and 6, and pins 2 and 7 are connected together. This arrangement permits the use of any of the octal base rectifier tubes. The power transformer occupies the left hand rear corner of the chassis.

The ECO

The ECO itself is contained in a Parmetal 3" x 4" x 5" utility box and the wiring diagram is self-explanatory. The coil, L_1 , was picked up at surplus for a dime. It is marked "L-205" and is about 1½" long. Two threaded holes in one end permit fastening to the side of the ECO box. The coil consists of 24¼ turns of No. 20 tinned copper wire, wound on a threaded ceramic form ¼" in diameter with the individual windings spaced approximately the diameter of the wire and is tapped 3¼ turns from one end.

The tuning condenser, C_1 , is mounted on the rear of the box and an insulated shaft is coupled to the rear extension of the condenser shaft then, in turn, coupled to the dial. Incidentally, the dial must be mounted first, and the holes laid out with great care, as the dial will just exactly fit within the three-inch dimension of the box. As the panel from which the surplus dial was removed is thicker than the side of the ECO box, it is necessary to use washers with the three screws which secure the dial. After the dial is installed, the hole on the opposite side of the box for the condenser mounting may be made, being careful to locate

it so that the condenser shaft and the dial coupling will be perfectly centered. If that is not done, the dial will bind and not turn free. Care must also be exercised not to damage or even scratch the worm gear in the dial, as any defect will cause the dial to bind at that point and not operate smoothly.

Considerable experimenting was done with the various fixed capacities and the proper temperature coefficients required to insure continuous stable operation. The arrangement finally adopted has no appreciable frequency drift thirty seconds after the filaments are turned on, and no changes in calibration have been noted over a period of several months, checking against an accurate frequency meter with an accuracy of .003%. The ECO is considerably more stable than the Navy type LM or its Army equivalent BC221, which maintain an accuracy of .01%. For this reason, no additional variable compensating condenser was found necessary, although it had originally been planned to add a small capacity trimmer condenser across the main tuning condenser for screwdriver adjustment from the side of the ECO box. Due to the excellent stability which was obtained, it was also considered unnecessary to incorporate a 100 kc. crystal and associated circuit in the unit.

The range from 3500 to 4000 kc. is well centered, covering from 230 to 2126 on the dial. This represents 996 direct reading dial divisions for the 80-meter band which anyone will agree should be sufficient. Harmonics for either v.f.o. or frequency measuring purposes are usable to at least 30 megacycles, but have not been checked above that point.

One of the tests used in connection with temperature compensation was to fasten a lighted cigarette to a wooden dowel and hold the hot end of the cigarette adjacent to various components within the ECO box, after zero beating the ECO output with another frequency meter, or the station receiver. With the component values as given, it was impossible to obtain any perceptible frequency drift after allowing the ECO to warm up for thirty seconds. Coupling the v.f.o. to the transmitter does not affect the frequency, and in fact direct shorting of the coaxial output terminal makes no change in the pitch of the note that can be detected by ear. Apparently one isolation stage is entirely adequate.

The ECO section should be wired except for C_3 , a 6SK7 tube inserted in the socket and 6.3 filament volts placed between the filament lead and the box. Next a 45 volt "B" battery or other high-voltage source should be connected between the HV lead and the box (ground). This procedure is necessary for determining the condenser to be used for C_3 as described below, and the signal may be picked up on the station receiver as precise calibration is unnecessary.

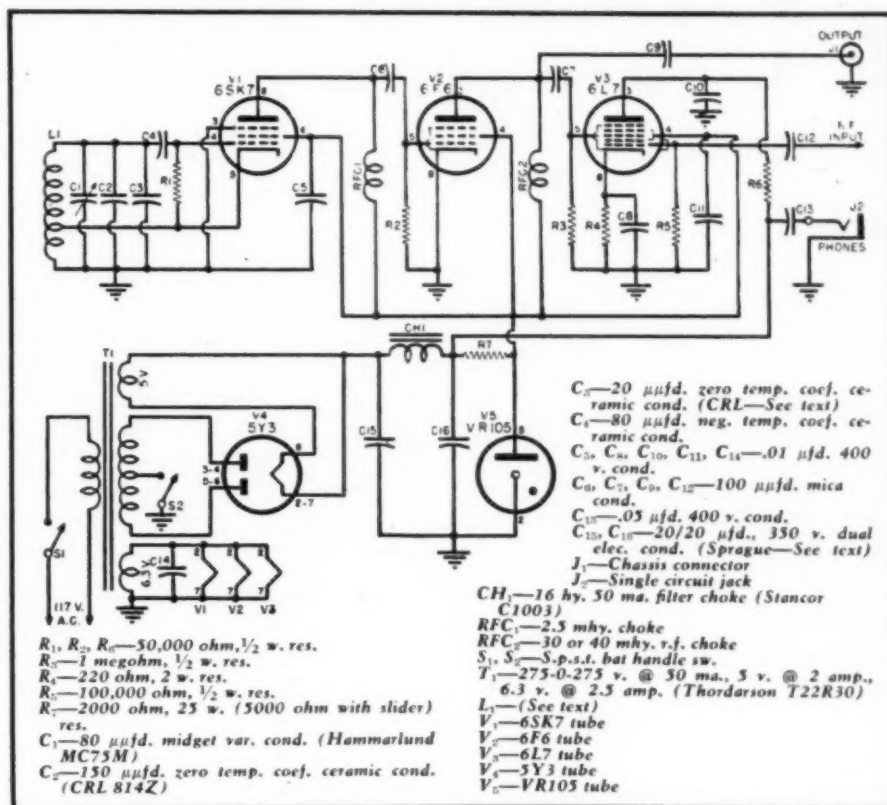


Fig. 1. Complete schematic diagram of dual-purpose frequency meter-v.f.o.

The wiring diagram shows C_3 as 20 μ fd. The CRL ceramic tube zero temperature coefficient condensers are supposed to have a capacity tolerance of $\pm .5 \mu$ fd. in the low values and $\pm 2\frac{1}{2}$ per-cent in the higher values. Actually one marked 175 μ fd. was closer to 195 μ fd. For centering the band, since no trimmer condenser is used, it is necessary to determine the condenser to be used for C_3 experimentally before the ECO box is put in place on the chassis. In one case, a condenser marked 20 μ fd. centered

(Continued on page 118)

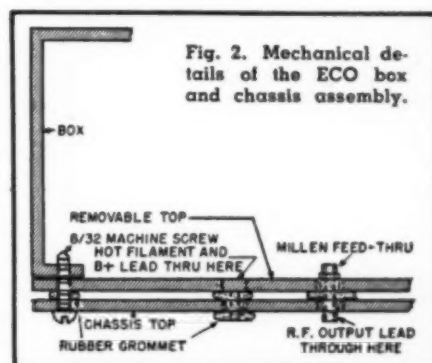
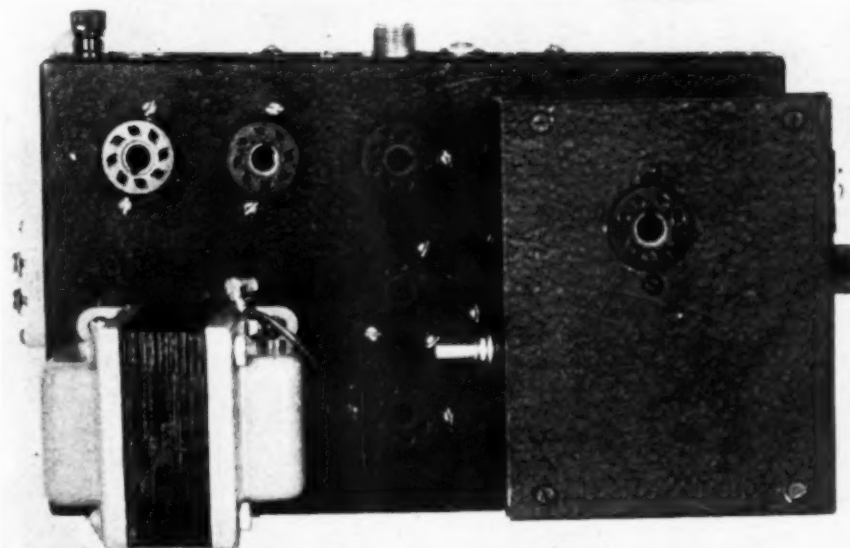


Fig. 2. Mechanical details of the ECO box and chassis assembly.

Top view of the home-built unit. Although it does not appear so in the photograph, the 3x4x5 inch ECO box is centered on the chassis.

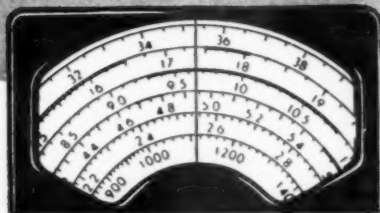




International

SHORT-WAVE

Compiled by **KENNETH R. BOORD**



WE ARE pleased to dedicate the May *ISW Department* to radio in the new Dominion of Pakistan.

At present, *Radio Pakistan* has transmitters operating in four of its principal cities—Karachi (national capital), Dacca, Lahore, and Peshawar.

In Karachi there are two m.w. stations—one of low power and one of fairly high output. The low-powered transmitter operates on 1,452 kcs., power unknown; the high-powered one is on 825 kcs. with 10 kw. Presently inactive is 850 kcs. which serves as an alternate for 825 kcs. Karachi's short-wave outlet is listed officially on 6.075 with a power of 250 watts. It radiates the network programs of *Radio Pakistan* originating in Karachi. The alternate short-wave channel is 6.120 (inactive).

Dacca's m.w. outlet is on 1,167 kcs. with 5 kw. power. The present s.w. channel in use is 15.270 with 7.5 kw. power; alternate s.w. frequencies of 11.890, 4.950, and 3.460 are now inactive. The Dacca short-wave station relays the 1,167 m.w. transmitter as well as a few network programs direct from Karachi (chiefly the *English* news).

Lahore is operating currently on m.w. only, on 1,086 kcs., 5 kw.; it re-

lays network programs from Karachi as well as originating regional programs from its own studios.

Peshawar, like Karachi, has one low-power and one high-power m.w. transmitter, on 1,500 kcs. and 629 kcs., with 250 watts and 10 kw., respectively; relays network programs and also originates its own regional broadcasts.

In addition, *Radio Pakistan* has a number of m.w. and s.w. stations under construction. These include:

KARACHI—A 7.5 kw. station is under construction with assignment to 3.450 and 4.935; a 20- and a 100-kw. transmitter are "reported" to be under construction, but no frequency assignments have been announced.

PESHAWAR—A 7.5 kw. transmitter is under construction for assignment to 3.320 and 4.790.

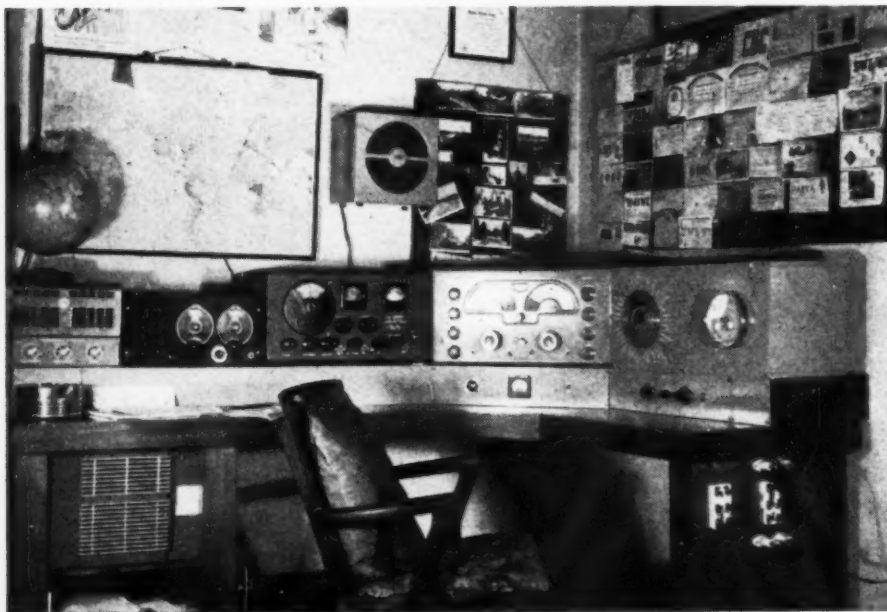
LAHORE—A 7.5 kw. job is under construction for assignment to 3.355 and 4.818.

MULTAN—A 7.5 kw. station is under construction for assignment to 3.385 and 4.910; a 5 kw. transmitter, to be assigned to 600 kcs.

Other m.w. outlets, either projected

(Note: Unless otherwise indicated, all time is expressed in American EST; add 5 hours for GCT. "News" refers to newscasts in the English language. In order to avoid confusion, the 24 hour clock has been used in designating the times of broadcasts. The hours from midnight until noon are shown as 0000 to 1200 while from 1 p.m. to midnight are shown as 1300 to 2400.)

This attractive and well-equipped Listening Post is that of Jack F. Gardener, Jacksonville, Florida. Jack is American representative of the ISW Club, London.



or under construction, include Hyderabad (Sind), 910 kcs., 5 kw.; Bannu, 950 kcs., 1 kw.; Quetta, 1,040 kcs., 10 kw.; Gutrat, 1,055 kcs., 1 kw.; Sialkot, 1,195 kcs., 1 kw.; Sylhet, 1,200 kcs., 1 kw.; Jessore, 1,250 kcs., 1 kw.; Bhawalpur, 580 kcs., 1 kw.; Lyallpur, 675 kcs., 1 kw.; Montgomery, 715 kcs., 1 kw.; Sukkur, 780 kcs., 1 kw.; Chittagong, 795 kcs., 5 kw., and Sheikheura, 825 kcs., 1 kw.

Owner of all the stations is the Pakistan Government with headquarters in Karachi, Sind.

Incidentally, in Lahore, Karachi, and Peshawar the dominant language is Urdu, while for Dacca it is chiefly Bengali.

The most commonly-heard short-wave outlet from Pakistan is *Radio Pakistan*, Dacca, on 15.270, which first started operations on 11.890. It moved to 15.270 on February 13, presumably to escape severe QRM from the "Voice of America in Manila" on 11.890.

Dacca's schedule appears to be daily at 2030-2200, 0100-0130, 0140-0230, 0600-1130; news has been heard at 2130, 0730, 1030. Since the day the transmitter moved from 11.890 to 15.270, I have found the 19-m. channel best here in West Virginia around 0730 when news is presented. I have heard location and frequency announced at 0745 just preceding "tonight's announcements" (in *English*). The station usually can be heard here also at 2130 with the news, but in the evening it is much weaker and often has CWQRM. Mornings it is in the clear and normally is quite readable to around 1030 news time when a powerful carrier causes interference. (I believe the QRM is caused by the carrier of WCBN, New York City, during its "warm-up" period at 1030-1115. During that time, *Radio Pakistan*, Dacca, is partly readable here.)

An Indian correspondent tells me that the s.w. transmitter at Dacca was constructed in seven weeks by three engineers and four assistants.

I have not yet received current schedules of other Pakistan stations but I believe they are similar to that of Dacca.

Pearce, England, has received a letter from *Radio Pakistan* in Karachi, stating that its transmitter there is still working on 6.070 (officially listed 6.075), and that the transmissions heard late in 1948 on 6.210 were not from *Radio Pakistan*.

(Continued on page 140)

RADIO & TELEVISION NEWS

Build Your Own 10.7 mc. DISCRIMINATOR TRANSFORMER

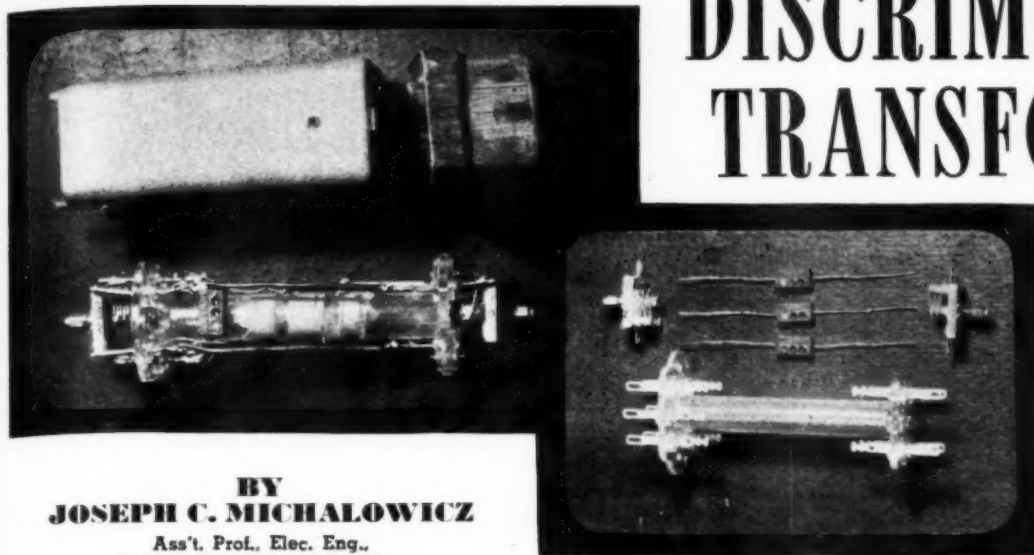


Fig. 1. Parts required to construct discriminator transformer. Photograph shows the fixed and tuning condensers, coil form, shield can, and the completed assembly.

BY
JOSEPH C. MICHALOWICZ

Ass't. Prof., Elec. Eng.,
Catholic University of America

**"Learn by doing"—it is not a difficult task
to build your own discriminator transformer.**

SINCE frequency modulated signals are time axis modulations which are in quadrature with amplitude modulations, customary types of demodulators used in amplitude-modulated receivers cannot be used for separating the intelligence from the modulated carrier current. In the high-frequency and intermediate-frequency networks of an FM receiver, the circuits are very similar to those employed in the customary superheterodyne type of AM receivers, with the principal exception that the networks must accommodate a broader frequency spectrum. (See "New Band FM Receiver," p. 51, RADIO NEWS, April, 1948.) But the second detector in an FM receiver functions much differently from the detector in an AM receiver, it being a special circuit, called a discriminator, that must change the frequency modulation into a variable amplitude signal. It is the most important part of the FM receiver and should be designed and built with much care. It is worthy to note that not only does the discriminator circuit perform its primary function of demodulating the FM signal, but eliminates certain types of static. When a certain abrupt interference enters the i.f. stages of the receiver, a series of spectrum amplitudes of similar polarity, acting simultaneously and symmetrically with respect to the mid-frequency, is produced. Since inputs to a discriminator, consisting of equal simultaneous positive voltages displaced from the mid-frequency, produce zero output voltage, the interference is virtually eliminated in the audio stages of the receiver.

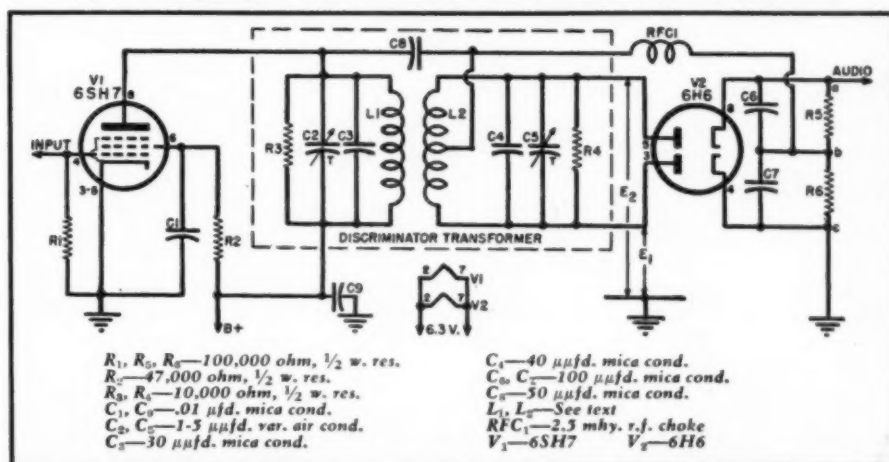
The basic type of discriminator is the balanced discriminator circuit shown in Fig. 2. The 6SH7 tube is the last limiter stage of the receiver and produces a voltage drop across the inductance L_1 which is the primary of the double-tuned transformer L_1-L_2 . This transformer is tuned to the i.f. frequency of the receiver, F_c . The secondary of the transformer is center-tapped and the output is supplied through two diode rectifiers to the resistive loads R_3 and R_4 . The voltage drops across these two load resistors are in opposition, and if the signal supplied to the discriminator is equally divided between the two diodes, the

voltage drop across "a"-"c" will be zero.

The resultant voltages E_1 and E_2 , applied to the two diodes, have two components: one supplied through the condenser C_4 , and the other inductively through the transformer L_1-L_2 . If the input signal is exactly at the i.f. frequency, these two components are displaced by 90° and the resultant voltages E_1 and E_2 have the same magnitude, thus causing a zero voltage drop across "a"-"c." However, should the frequency of the incoming signal deviate in one way or another from the resonant frequency of the discriminator transformer, the displacement angle between the two component voltages will in one case increase and in the other decrease, thus causing a difference in the magnitudes of the resultant voltages supplied to the diodes. This in turn will cause different voltage drops to occur

(Continued on page 143)

Fig. 2. Wiring diagram of the discriminator transformer and its associated circuit.



The Tubeless GRID-DIP Adapter

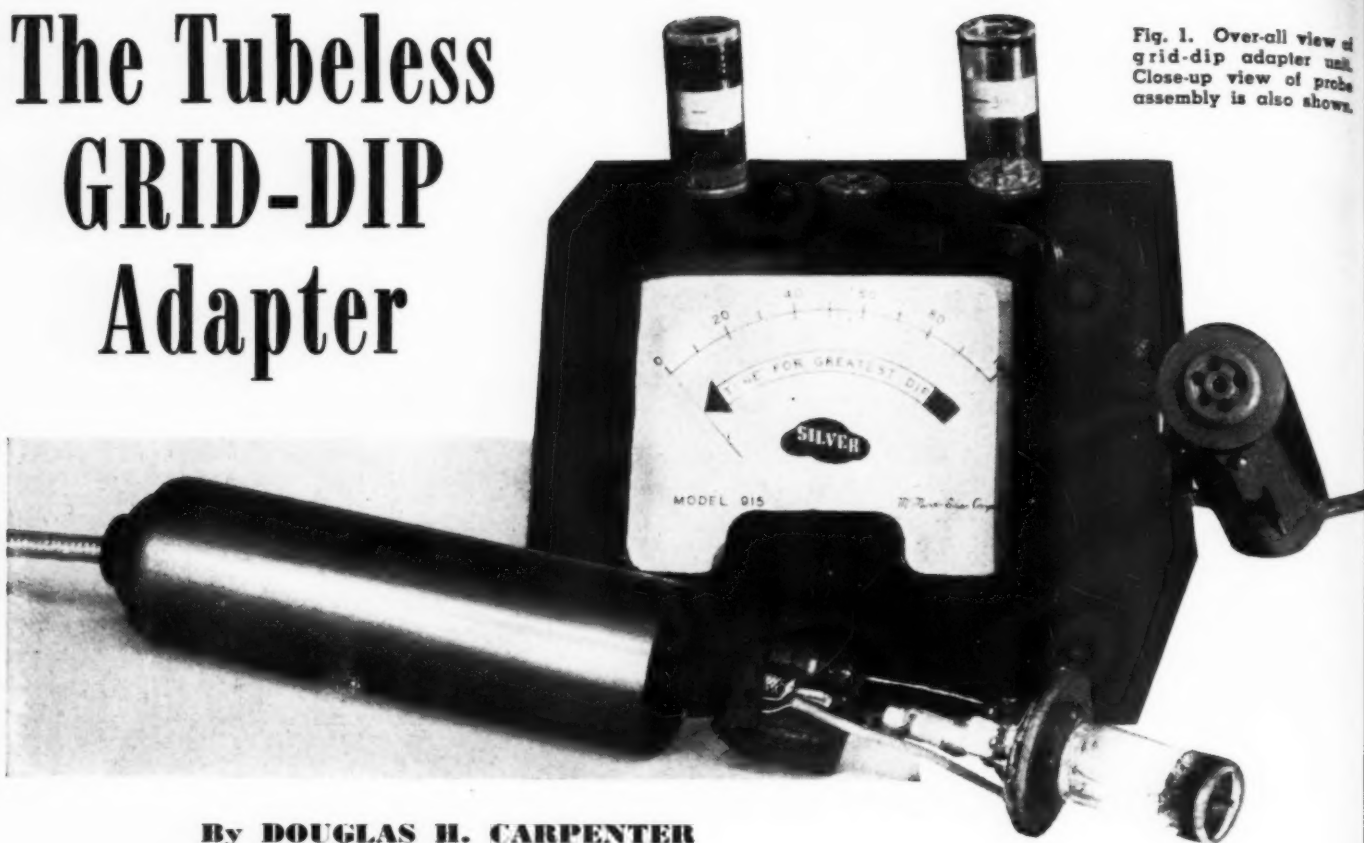


Fig. 1. Over-all view of grid-dip adapter unit. Close-up view of probe assembly is also shown.

By **DOUGLAS H. CARPENTER**

Chief Eng., McMurdo Silver Co., Inc.

This novel unit converts any signal generator or test oscillator to a direct-reading resonance indicator.

THE complex problems encountered by the modern service technician are far removed from those he was required to solve even a few years ago. There has been a gradual transition in servicing technique that identifies itself with the addition of several new and radically different instruments in every progressive radio shop. The new fields of FM and television impose problems that have no counterpart in the average serviceman's experience. The conglomeration of separate instruments required to perform all necessary measurements on present-day equipment represents a considerable initial investment, and is time-consuming from the standpoint that several are needed to analyze even a "run of the mill" service job. Although the unit to be described is designed primarily for the service technician, it has wide application in laboratory, production-testing, and amateur work.

One technique has always been endorsed by technical authorities, and the application of this principle has been followed to the present day. This principle is that of using the signal itself as the medium of determining circuit function. With the advent of high frequency transmission (FM and TV), such a method is no longer practical. Measuring apparatus invariably adds undesired elements to the circuit under test. When dealing with an

amplifier that may be detuned by 2 μ fd., the foregoing statement is certainly justified.

Means, therefore, must be devised to circumvent this inadequacy and allow quick, sure checking of this specialized apparatus. The method to be described is ideal, as it allows measurements without direct mechanical coupling. It permits measurement of all but oscillator frequencies, without the circuit's being energized. It makes possible laboratory caliber comparisons in a simple direct-reading form, eliminating tedious, time-consuming figuration. Every practical frequency range is covered, the only limitation being that of the coupling signal source.

As the heading denotes, the instrument under discussion is primarily a resonance indicator of markedly advanced design. Because of the unit's broad application, it is believed that this article should prove of value to every reader, whether engineer, technician, serviceman, or amateur.

Over a period of time, several authors have described and advocated the use of a grid-dip meter. Essentially, the grid-dip meter is nothing more than an oscillator whose grid current can be changed by coupling an external load to the oscillating tank circuit. The amount of loading depends on the degree of coupling and the Q of the external circuit. If we

had an i.f. transformer that was tuned to 455 kc., for example, we could check its actual resonance by coupling the grid-dip meter coil field close to this transformer. As the grid-dip oscillator was tuned to the exact frequency of the specimen under test, a pronounced dip would be observed. This is clearly accounted for by the loading effect of the external circuit upon an oscillator, which is inherently a source of extremely poor regulation. By utilizing several coils, it is possible to cover a certain frequency range and determine the resonant frequencies of all tuned circuits, whether they are energized or not. Band-switching is impossible, because of the physical size of the unit. As the higher frequencies are employed, full-scale deflections are difficult to attain, because of the ratio of oscillator efficiency. The physical size of the calibrated dial must be small because of the necessary miniature size of the total unit.

It is this author's opinion that the very valuable grid-dip oscillator never achieved popularity throughout the service profession because of several shortcomings listed above, and also because of its necessary physical size. There is no other single instrument that can perform as many diversified measurements as the grid-dip meter, nor is there a combination of instruments that can perform such measurements as quickly.

The Model 915 "Tubeless Grid-Dip Adapter," in conjunction with a sig-

nal generator, duplicates all of the functions of the old grid-dip meter, and does this without undesired complications. The sensitivity is much higher than that of the grid-dip type, thereby allowing greatly expanded utility. It also permits measurement without oscillator detuning.

As the title indicates, this unit is an adapter and is intended to be used with any signal generator or test oscillator. The output of the generator is connected to the adapter by attachment to a screw terminal located in the instrument back plate. If the generator is on and one of the three coils is plugged into the test probe, a full scale meter reading will be observed. The degree of meter deflection is controlled by the output attenuator of the generator itself. The three coils provided cover the continuous range of 100 kc. through 300 mc. The only frequency limitation is that of the companion generator. Since there is usually a large second, third, and fourth harmonic content in the output of any generator on its highest frequency range, the usefulness is proportionally extended.

We have described a little companion unit that multiplies the value of any standard signal generator that the serviceman now has. At this point, it might be appropriate to outline a typical application.

A timely example might be that of an over-all check of a television receiver. With the generator connected to the adapter, plug in the probe coil covering the receiver i.f. range. Switch the generator to the proper range. Adjust the generator output for a comfortable meter deflection. Place the probe close to the last i.f. coil, and tune the generator until a pronounced dip is observed. Tuning the generator either side of the point of greatest dip will allow direct reading of the i.f. selectivity response. This is directly read from the generator dial. In this case, and in all operations, the tolerance, or frequency accuracy, is that of the generator, which is an extreme advantage over former types. The probe is now moved, by the same method, successively to each i.f. transformer, and similar evaluations are made. The r.f. section now can be checked by the same system. During these operations, the television set does not have to be turned on. If it should appear necessary to check the oscillator, the set is turned on and a headset plugged into the jack provided on the unit. When the signal generator is tuned to the same or a submultiple frequency of the TV oscillator, a loud squeal will be heard in the phones. Simultaneously, the meter will kick downward. For r.f. measurement, the proper coil must, of course, be used. Generators having restricted fundamental ranges but usable harmonics work just as well as more expensive types for this application.

It would be impossible to describe all applications of this test unit in the

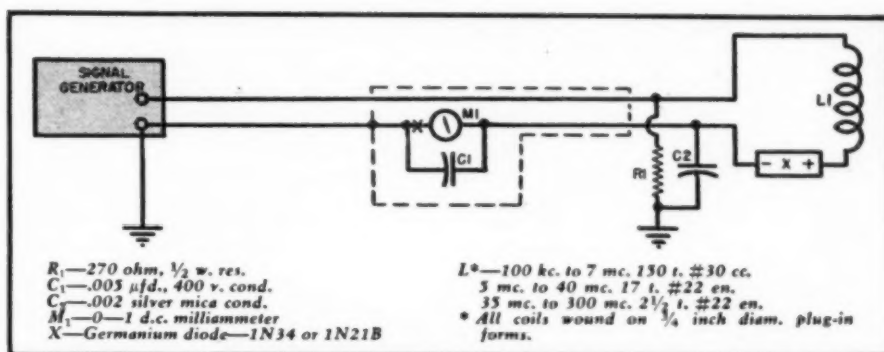


Fig. 2. Complete schematic diagram. Unit covers 100 kc. through 300 mc. A closed circuit jack is inserted at point (X) if audio indications are desired.

allotted space. Under the following basic classifications have been itemized several of the more important functions that this instrument is capable of performing.

Resonance Indicator

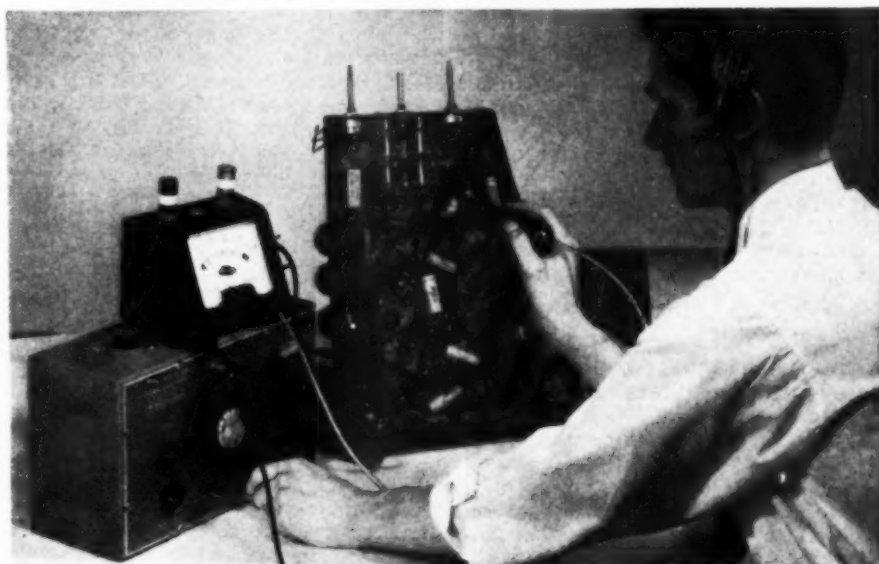
This function is about the most important from an over-all use standpoint. The circuit under measurement does not have to be energized for this type of checking. The adapter unit is utilized as a grid-dip meter, and is coupled to the companion signal generator. Coupling the appropriate probe coil, inductively, to the circuit or specimen under test will permit direct reading resonance indications. Such indication is, of course, the pronounced meter dip as the generator is tuned through the proper frequency. Under this heading would be such measurements as i.f., r.f. alignment, and general checking. Transmitter tuning would be another application. In design work, all tuned circuits can be carefully evaluated and preset. Production checking of coils and tuned circuits in sub-assemblies is also made much faster. Antenna resonance may be quickly determined. Relative Q of individual components by comparison is also possible. The photograph below shows a technician using the

unit in conjunction with a standard signal generator to make a quick check of a television i.f. strip. Since this adapter will respond only to the proper resonance point, no misleading effects can exist.

Energized Detector

A phone jack is provided so that both audio and visual indications are possible when using the test instrument as an energized detector. The external circuit to be tested may be an oscillator of any type, operating in the aforementioned range of 100 kc. to 300 mc. With the unit connected to the signal generator, plug a headset in the jack provided. When the signal generator is tuned to the fundamental or harmonic frequency of the oscillator, a loud squeal will be heard in the phones. Such a measurement is valuable, as it allows pin-point accuracy when zero beat is reached. To determine where the oscillator should be working, the dip method previously described may be employed prior to this check. Oscillator tracking, output, etc., may be easily analyzed. The probe coil, in this case, may be very loosely coupled to the circuit under test. A complete TV oscillator section may be very quickly set by this method. (Continued on page 112)

Serviceman illustrates how the grid-dip adapter unit is used in conjunction with a signal generator to check resonant frequency of a television tuned circuit.



Regenerative SHORT- WAVE RECEIVER in Miniature

By **ROBERT H. HAWKINS**

Instructor, Purdue University

Build this low-cost receiver and make DX-ing a pleasure. It covers 5.5 to 18 megacycle band.

A MINIATURE short-wave receiver that would give fine performance was the objective when this unit was designed, and it has more than fulfilled all expectations.

The use of a separate receiver for covering the 5.5 to 18 megacycle band of frequencies was prompted by the need of really great sensitivity and selectivity to cover the 20-meter amateur band. Most two-band home receivers will cover this band of frequencies, but without the sensitivity found in this regenerative receiver. Regeneration was chosen to give the extreme sensitivity desired, and a stage of tuned radio frequency amplification ahead of the regenerative detector gives excellent selectivity. No electrical bandspread arrangement is employed on this unit and hence the entire 20-meter amateur band is covered in about 4 dial divisions. However, this receiver has a vernier dial and little trouble has been experienced in separating the many amateur stations on this band. A 6C4 triode audio amplifier drives the 6AK6 power amplifier to give plenty of gain for loudspeaker operation on most stations. The audio quality is good and the BBC Symphony from London has been received with excellent quality. It is a fortunate fact that the higher-frequency bands are relatively static-free; thus one of the advantages of frequency modulation,

freedom from static, is approximated in this receiver. For extremely weak signals, a phone jack is supplied, but the author has found little need for it. Amateur stations as far distant as Jerusalem, Palestine, have been received with amazing clarity.

The small size of the receiver makes it an attractive addition to any home. Miniature tubes are used throughout giving excellent performance and filling the small space requirement. Referring to Fig. 1, a photograph of the receiver, the loudspeaker can be seen at the left end of the front panel with the phone jack below it. The bar knob farthest left is the audio gain control with the regeneration control at its right. The vernier-type dial for main tuning is mounted in the center of the panel. The r.f. stage is gang-tuned with the regenerative detector to make for ease of tuning. It was expected that some difficulty would be encountered in trying to make such a combination track over the entire range of frequencies when this unit was first constructed. However, a slight revamping of the number of turns added to the oscillator coil has made for good tracking. The oscillator coil used was a standard *Stanwyck* S-231 and 12 turns of #22 enameled wire were added as shown in the detail drawing (Fig. 5). Two solder terminals are added between those already on the coil to give a total of five

terminals—plate, "B plus," grid, oscillator tap, and ground. It is suggested that a coating of wax be added after the new winding and terminals are completed. The antenna coil (*Stanwyck* S-410) is used with no changes and is so placed as to give extremely short leads. The 6AU6 r.f. amplifier not only increases the selectivity of the receiver, but prevents any excessive radiation from the antenna.

To begin construction of this receiver, it is suggested that the following steps be followed. First, study the photographs and circuit diagram until thoroughly familiar with the use and placement of each part. Looking at Fig. 4, the top view of the receiver, let us identify the components. The power transformer is at the upper-left corner of the chassis with the 6X4 rectifier tube and electrolytic filter condenser directly behind it. The two-gang main tuning condenser is in the center of the chassis with the filter choke behind it. Starting at the antenna binding post and working towards the front panel, we find the antenna coil, 6AU6 r.f. amplifier, oscillator coil, 6AU6 regenerative detector, in that order. Starting at the panel in the next row, we find the 6C4 audio amplifier, 6AK6 power amplifier, and audio output transformer. The output leads of the transformer are connected to a Jones terminal strip and thence to the voice coil of the loudspeaker. The parts list should be checked against the photographs to make certain that no parts are omitted or misplaced. Second, lay out a full-size template of the chassis and front panel and then fasten with

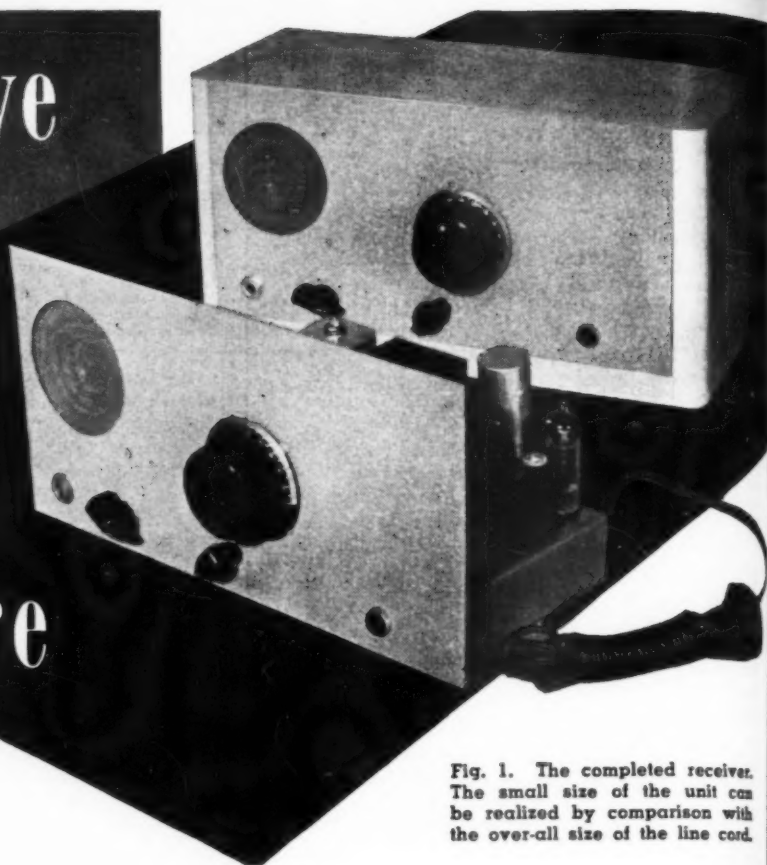


Fig. 1. The completed receiver. The small size of the unit can be realized by comparison with the over-all size of the line cord.

"Scotch" tape to chassis and panel for center punching and drilling. Leave the templates on the parts while drilling as it prevents errors in hole sizes which could ruin the chassis. As long as the templates are correct, then the chassis and panel will be correctly drilled. Third, mount all parts before attempting any wiring and make certain that the tube sockets are mounted so as to give the shortest possible leads. The antenna and oscillator coils should also be mounted to give short leads without any crossovers inside the shield can. A suggestion that will ease the job of wiring is that of removing the 0.5 megohm potentiometer and switch until the regenerative detector is wired. After the wiring on that particular tube socket is completed, the potentiometer can be placed in position.

The wiring job on the receiver can be simplified by duplicating the wiring shown in the bottom view photograph of the receiver. In Fig. 3, the bottom view, a paper condenser can be seen mounted on the outside of the left end of the chassis. This condenser is C_{11} which connects to the phone jack. Start with the leads coming out of the secondary of the power transformer and commence wiring the power supply. It will be noted that several insulated solder terminals are placed in the chassis to make for ease of connecting the different circuits. Solder the 6.3 volt filament leads to pins 3 and 4 of every tube, then place all the paper condensers in their proper positions. The resistors and mica condensers are placed in position last, but of course, follow the suggestion of wiring the regenerative detector completely before placing the 0.5 megohm regeneration control in its proper place on the chassis.

In selecting parts for the receiver, remember that a good deal of effort will be spent in constructing it, and a faulty component can cause all sorts of difficulties. Using quality components will be a good insurance of long life and good operation. The main tuning dial used in the original unit was removed from a war surplus tuning unit TU-5B and was slightly revamped. A National Velvet-Vernier dial will fill the bill exactly for this

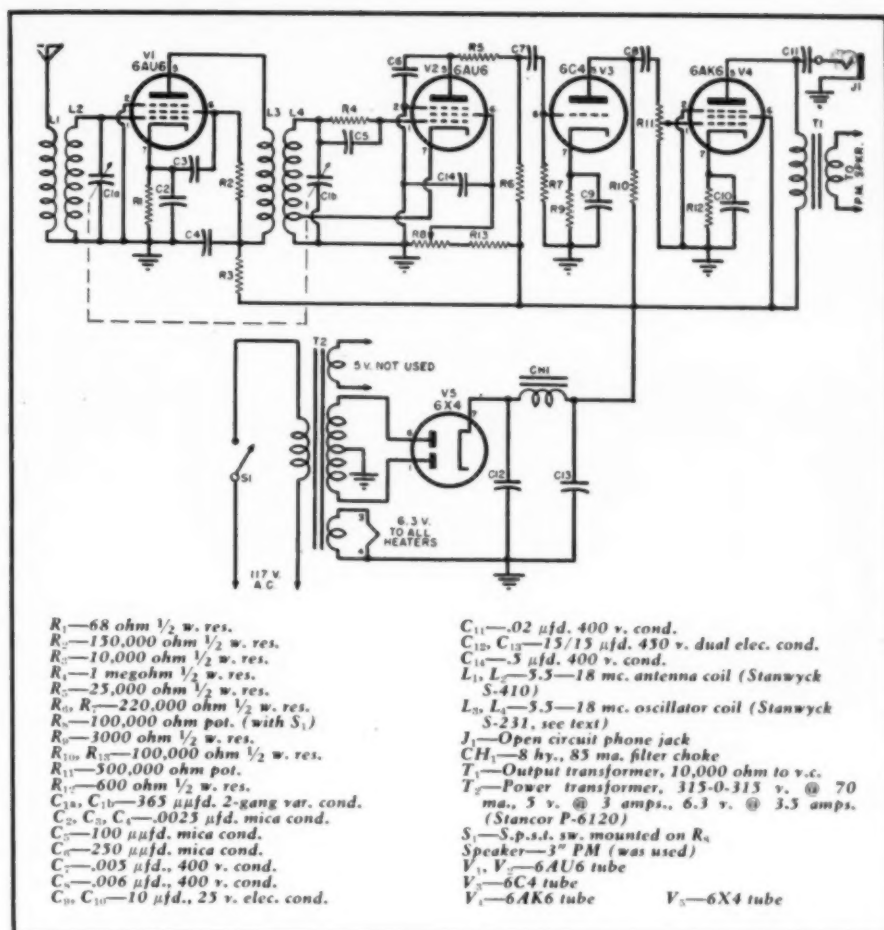


Fig. 2. Complete schematic diagram of the a.c. operated regenerative receiver.

receiver if one is available; however, the entire tuning unit mentioned above can be purchased on war surplus for about \$3.00. The crackle finish shown on the front panel was sprayed on in two coats and baked in an oven. It might be suggested that those having some woodworking experience could easily build a cabinet that would harmonize with period furniture.

Alignment and test of the receiver can be completed in a short time using a standard signal generator and an output meter. Simply inject a signal of 5.5 megacycles into the antenna binding post and adjust the permeability-tuned antenna coil and oscilla-

tor coil until maximum signal is indicated at the speaker terminals by the output meter. Then set the signal generator at 18 megacycles, tune the receiver to the high-frequency end of the dial and make any minor adjustments necessary to again give maximum signal indication.

The original unit locates the 20-meter amateur band at about 70 on the 0-100 dial scale. Regeneration control is smooth and the gain control is usually set about half way towards maximum position. A few pointers on how to tune a regenerative receiver may be in order. After the set has

(Continued on page 106)

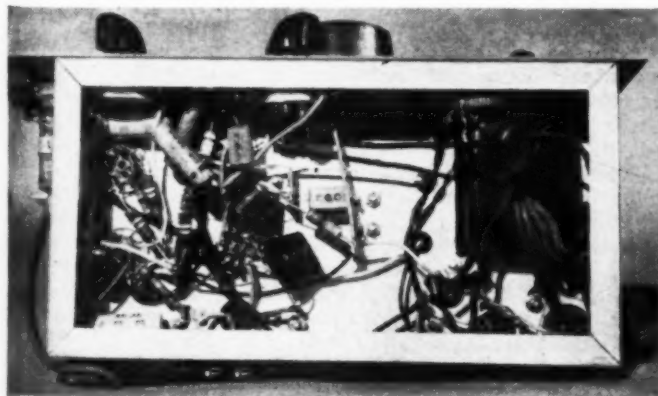


Fig. 3. Bottom view of receiver showing under-chassis components. An exact duplication of parts layout is not necessary.

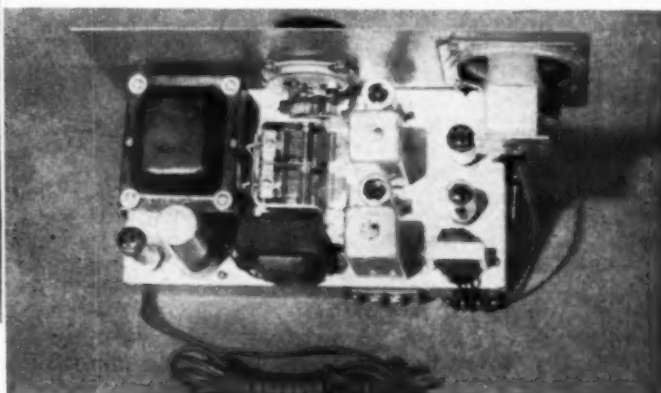


Fig. 4. Top view of receiver showing correct placement of components. Vernier dial used was a revamped surplus unit.



Modern TELEVISION RECEIVERS

By
MILTON S. KIVER

Part 14. A complete analysis of the design and operation of Inter-carrier TV sound systems.

TO THIS point we have been studying what might conveniently be called the conventional television receiver. In this receiver, shown in Fig. 1, the audio and video signals, after passage through a mixer, are reduced to their i.f. values. At some point after the mixer and before the video second detector, the sound i.f. signal is removed from the video i.f. system and fed to a separate set of i.f. amplifiers which are peaked to the sound i.f. value. After two or three i.f. stages, the audio signal is fed to an FM detector where it is converted to audio frequencies. This is then followed by one or more stages of audio amplification after which the signal is

powerful enough to drive a loudspeaker. Once the two signals have been separated, every precaution is taken in the video system to prevent any sound voltage from reaching the video detector and the subsequent cathode-ray tube. Usually these precautions consist of one or more trap circuits distributed throughout the video system following the point of signal separation.

While this system will operate successfully when properly designed, it does possess several disadvantages when cost becomes an important design factor. Thus, one of the most important stages in the television receiver, the local oscillator, is also one

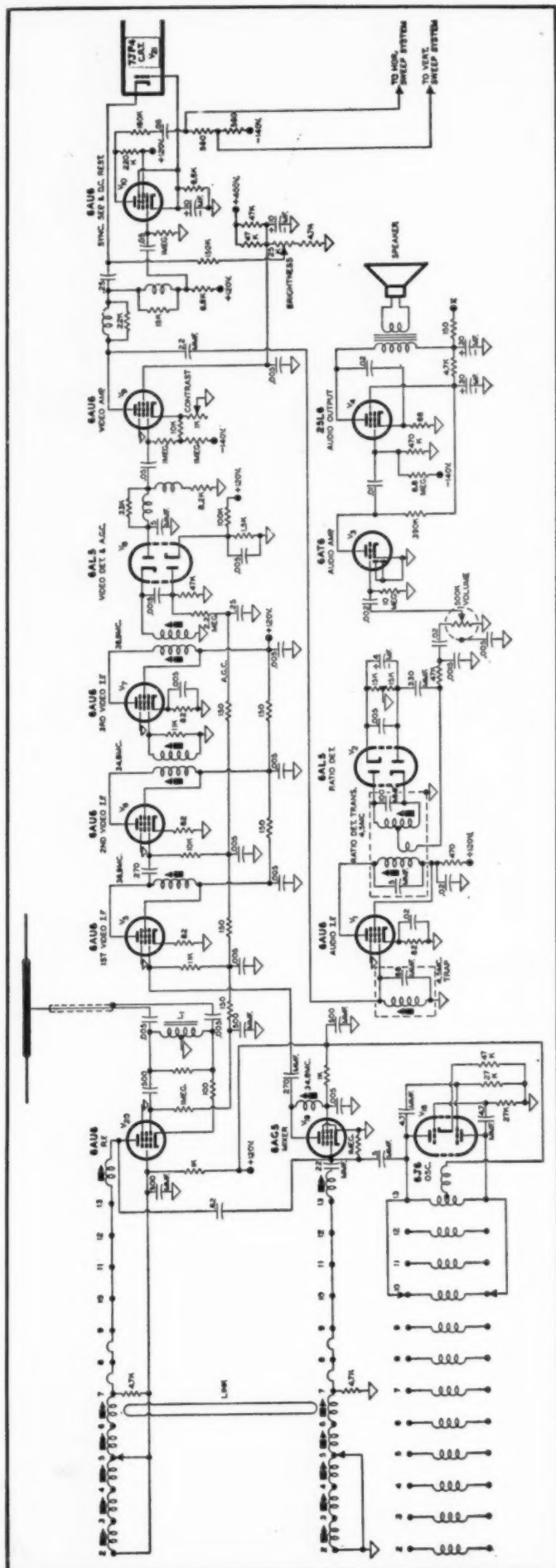
Present-day television receivers that are designed around an Inter-carrier sound system. There are many other TV receivers on the market today that employ the same system.

of its weakest points. We know that the sound i.f. value is the difference between the frequency of the local oscillator and the frequency-modulated sound carrier. If the frequency of the local oscillator should drift, either during the warm-up period when the set is first turned on, or during the operation of the receiver, then the difference frequency produced as a result of the mixing in the mixer will change, too. Thus, consider the case of a television receiver tuned to channel 3 and designed for a sound i.f. of 21.25 mc. On channel 3, the audio carrier frequency is 65.75 mc. and since the oscillator frequency is above this by an amount equal to the sound i.f., the oscillator frequency will be 65.75 mc. plus 21.25 mc., or 87.00 mc. The sound carrier is frequency-modulated, and the modulation shifts the audio carrier frequency plus and minus 25 kc. In other words, the total audio signal for channel 3 can be expressed as 65.75 mc. plus or minus 25 kc.

In the sound i.f. system (including the input discriminator coil), the band pass is about 200-300 kc., although generally the discriminator response is linear only for about 150 kc. If the local oscillator should drift by as little as 75 kc., it is possible for the sound i.f. signal to shift to a non-linear portion of the discriminator characteristic, thereby causing audio distortion. Now, a drift in frequency of 75 kc. with the oscillator functioning at 87 mc., represents a change of less than .09%; at 200 mc., the same frequency drift represents a change of .03%. Using ordinary components, combined with the station selector rotary switches, it can hardly be expected that the local oscillator will not drift more than this during warm-up and even during subsequent operation. It is due to this very situation that oscillators are provided with fine-tuning controls which, extended to the front panel, permit the observer to correct

From the block diagram, Fig. 2, it is seen that the audio and video signals are received by the r.f. stages of the receiver, lowered in frequency at the mixer by beating with the local oscillator voltage, and then both passed





this response for the Intercarrier sound system, it must be widened to include the sound i.f. signal, as indicated by the dotted line. However, instead of providing the sound carrier with as much amplification as the video signal receives, we provide it with considerably less amplification, and it is specifically because the sound carrier receives this lesser amount of amplification that the system is able to function. This is important, for if the level of the sound carrier is not kept considerably below the level of the video signal, the latter signal becomes completely unusable.

To understand why the sound carrier level must be considerably below the video signal level, let us look ahead in Fig. 2 to the video detector. The video and sound i.f. signals reach this point in the Intercarrier system after passage through the i.f. system. Now, a detector (such as used ordinarily for the video second detector) operates basically in the same manner as the previous mixer. In both, a mixing process occurs. Thus, in the mixer stage (which has long been known as the first detector), the local oscillator voltage beats with the incoming signal or signals to produce the i.f. signal. At the video second detector, a beating or mixing takes place between the video and sound i.f. carriers with the result that a 4.5 mc. beat note is produced. In this case we could consider the video carrier as being equivalent to the local oscillator and the audio carrier as the incoming signal. The result of the mixing is a 4.5 mc. beat note. In addition to the beat note, we also obtain all of the 0-4 mc. video frequencies from the video carrier.

The reason for keeping the level of the sound carrier low can now be given. Consider the two carriers shown in Fig. 4, A and B. Assume the larger one to be the video carrier and the smaller one to be the audio carrier. If these two signals are mixed together, a ripple will be produced in the resultant wave, Fig. 4C, which will have a frequency equal to the difference between the carrier frequencies. In this case this is 4.5 mc. As long as the amplitudes of the two carriers differ considerably, the amplitude of the 4.5 mc. beat note will remain small and unaffected by any amplitude modulation contained in the video carrier. Here is one of the pivotal points in the Intercarrier television sound system. By maintaining the sound carrier small in comparison to the video signal, we obtain a 4.5 mc. beat note which contains only the frequency modulation of the original sound r.f. carrier and practically none of the video modulation.

The sound carrier is continually shifting back and forth between the limits of plus and minus 25 kc. In the mixing process in the video second detector this frequency modulation is imparted by the sound i.f. carrier to the 4.5 mc. beat note. The 4.5 mc. signal represents the difference between the video and sound i.f. carriers. The frequency of the video carrier is fixed, but the frequency of the sound carrier continually shifts back and forth. This changes the value of the beat note. Thus, while we speak of 4.5 mc. as the beat note, we actually mean a beat note with a center frequency of 4.5 mc., but which shifts back and forth about this value to the limits of plus and minus 25 kc. This frequency shifting, remember, represents the sound intelligence of the television broadcast.

Now let us see how the foregoing is employed to make the Intercarrier television sound system workable. When the video carrier (with its amplitude modulation) and the audio carrier are received at the receiver, they have substantially the same amplitude. (The FCC regulations state that the power of the sound carrier be 50 to 150 percent of the power of the video carrier when transmitting synchronizing pulses. However, most stations transmit equal sound and maximum amplitude video carriers.) After passage through the mixer stage, the two signals are converted to their i.f. values and are ready to pass through the i.f. system. If we are to keep the degree of amplitude modulation of the beat note signal to a minimum, it is desirable to keep the level of the sound carrier at least 26 db. below the peak video carrier level at the

(Continued on page 100)

Fig. 7. A portion of the Tele-Tone 7-inch television receiver, which operates on the Intercarrier principle.

HAMS —

You Still Have Time To Enter The ...

RADIO & TELEVISION NEWS

\$10,000 00

NEW HAM CONTEST

★ **Closing date extended to March 1, 1950**

★ **Choice of U.S. Savings Bonds or Amateur Radio Equipment**

IN ANSWER to many requests and in recognition of the fact that much valuable training time is lost during the vacation period, the judges have decided to advance the closing date of the contest to March 1, 1950. Original closing date was December 31, 1949.

The issuing of new licenses and call letters by the FCC following the successful passing of the amateur radio license examinations sometimes takes as long as six weeks. The new closing date, therefore, will allow sufficient time for this processing to all those passing their exams prior to January 1, 1950, or even later. The two months following should find all new licensees, trained during the contest period, in possession of their coveted tickets. The contestant (trainer) will then have sufficient time to send us the dates and call letters shown on the new licenses of those trained during the contest period.

Contestants will, on or before March 1, 1950, send us the call letters and issuance dates of licenses of the new hams trained by themselves during the contest. These will be checked by the judges from the FCC lists sent to the

publishers of the Radio Amateur Callbook as of March 1, 1950.

U. S. Savings Bonds, if preferred by winners, will be awarded instead of equipment.

Don't underestimate your chance to win. Early entries are mostly from small towns and cities. Hams in our large metropolitan centers are getting off to a slow start. There's plenty of opportunity and time to "hit the jackpot!"

We know that we are all going to win additional prestige and security for our hobby.

That's worth much more than we hams can buy at any price.

How about *you* OM? Can Amateur Radio count on *you* to do your share?

Send in your entry NOW! Don't wait. Remember the new ham can give credit only to one individual or club as his trainer. It's to your advantage as a contestant to list your trainee on your entry blank promptly and send it in.

Remember "Amateur Radio Needs New Blood"

A TV ANTENNA ORIENTATION

By **FRED MARCO**

Consulting Engineer

This novel yet simple test instrument permits a service technician to install a TV antenna without additional help.



Service technician orientating an antenna using this easy-to-build instrument.

THE proper location and orientation of the TV receiving antenna has always been a major problem to the installation men and service organizations engaged in this type of work. Placing the receiver itself in a room location pleasing to the critical housewife, running the transmission line to the roof, and instructing the customer in the proper operation of the controls is a relatively simple and straightforward procedure, but getting the antenna in the best roof spot and orienting it for the maximum input to the receiver, with a minimum of "ghosts," has been a job requiring good judgment, much tinkering, and a lot of luck.

It has been almost impossible for one man, working alone, to effect the best compromise, unless possessed with infinite patience, lots of time, and energy enough to repeatedly run back and forth from the roof to the receiver, to actually see on the screen the result of a few feet movement or a few degrees rotation of the antenna. Although TV engineers and servicemen have been known to get their necks out pretty far, no one yet has achieved the ostrich-like length necessary to stand on the roof, rotate the antenna, and at the same time, watch the TV screen image.

In order to do a good job in a minimum amount of time, standard pro-

cedure among the better installation houses has been to send two men on a job, one of whom stays at the receiver and relays instructions to the roof man, by intercommunicating phones or by sheer lung power. While this method undoubtedly works to a reasonable degree, it is wasteful of manpower and time and also leaves a good deal to the judgment of the downstairs operator.

Now, if the man on the roof could see for himself the result of his adjustments, the maximum effect could be achieved in the minimum time, with complete assurance of peak performance. Since it would be a bit awkward to carry the receiver itself up to the roof, the logical method is the use of an indication device, small, light in weight, easy to read, and low in cost, which can be connected to the receiver and carried to the roof, and which visually interprets the quantity that mainly interests us, the brightness of the received image.

The instrument to be described does exactly this and is known as the *Simpson TV Antenna Compass*.

How To Use It

Actual use of the equipment is simple and straightforward. On a new installation, the receiver is first connected, turned on, and allowed to warm up thoroughly. Meanwhile the

transmission line is installed and the antenna set up temporarily in what appears a likely roof location, and oriented approximately to the direction of the transmitting station. Now, returning to the receiver, the two test clips associated with the junction box are connected to the set. One of these clips is conventional and furnishes the ground return, being merely connected to the chassis at a convenient point. The other clip, the "high" side, is of a special alligator type, having a needle point associated with the jaws in such a manner that the point pierces the insulation of any wire to which it may be attached, thus furnishing contact without the necessity of scraping insulation or finding an exposed terminal. This "high" clip must be attached to the modulated electrode of the picture tube, which in most receivers is the control grid. Some receiver designs put the control grid at ground (r.f.), and drive the cathode. In these cases the "high" clip should be connected to the cathode. The proper lead is readily apparent to the serviceman by inspection of the wiring diagram of the particular receiver being used. See Fig. 1A and Fig. 1B. Since all TV receivers must allow the base of the picture tube to float, the socket is wired to the chassis with flexible, insulated leads, and, therefore, this connection can always be easily made. It may not even be necessary to remove the metallic safety screen on the back of the receiver, since this high lead is usually long enough and has enough slack to be fished through the ventilation holes in the back, thus allowing the inch or so necessary for connection.

Now, with the two clips of the probe properly connected, the meter is plugged into the short extension fitting on the other end of the probe, and a station tuned in. If the receiver has a fine tuning control, this should be adjusted in the conventional manner, and then the contrast (video gain) control, adjusted for approximately half-scale meter reading. The meter itself has a "Hi-Lo" switch to reduce its sen-

RADIO & TELEVISION NEWS

LOCATION-AND-INDICATOR

sitivity if necessary, and this should be in the "Hi" position during these preliminary adjustments. The channel selected should be that of the station expected to be weakest and most critical at the receiving location. It will be noted that the meter reading will vary with the setting of the gain control and also will vary somewhat with the fine tuning control. Also, if the receiver is still "drifting," due to warm-up, the meter reading will also drift slightly. Therefore, all antenna adjustments must be made with the receiver operating at constant gain and tuning, in order to be relative and capable of later duplication, if desired. Leaving the probe connected, the meter itself is disconnected, and a length of ordinary two-wire extension cord, long enough to reach to the antenna, is substituted. Proceeding to the roof, with the meter and the other end of the extension cord, the meter is again plugged in, and will read the same as it did at the receiver. Since the fittings on the probe and meter are standard 115 volt household plug and socket, any ordinary extension cord can be used for this purpose, since the lead carries only a small amount of current at low d.c. potential. There is no a.c. or r.f. in the extension line and, therefore, it need not be special. No precautions need be observed other than to keep the cord a few feet away from the antenna lead-in.

With the meter on the roof, the antenna can be moved a few feet in different directions and rotated for maximum scale indication, with complete assurance that this maximum also coincides with the maximum input to the receiver and, therefore, maximum screen image brightness. It's just as simple as that!

If the original temporary situation of the antenna turns out to have been a poor one, the meter may actually go off-scale when a "hot" spot is found. By snapping the "Hi-Lo" switch to the "Lo" position, thus reducing the sensitivity of the meter, a trip to the receiver to reduce the gain is avoided. It is surprising how quickly and accurately the best antenna position and orientation can be found, taking all guess-work and personal judgment out of the argument. The actual adjustment of the antenna takes only a few moments.

With this optimum adjustment of the antenna for what was assumed to be the weakest station, it will be generally found that all other stations, when tuned in at the receiver, will give an even higher scale reading on the instrument, when returning to the receiver and re-checking. If this is

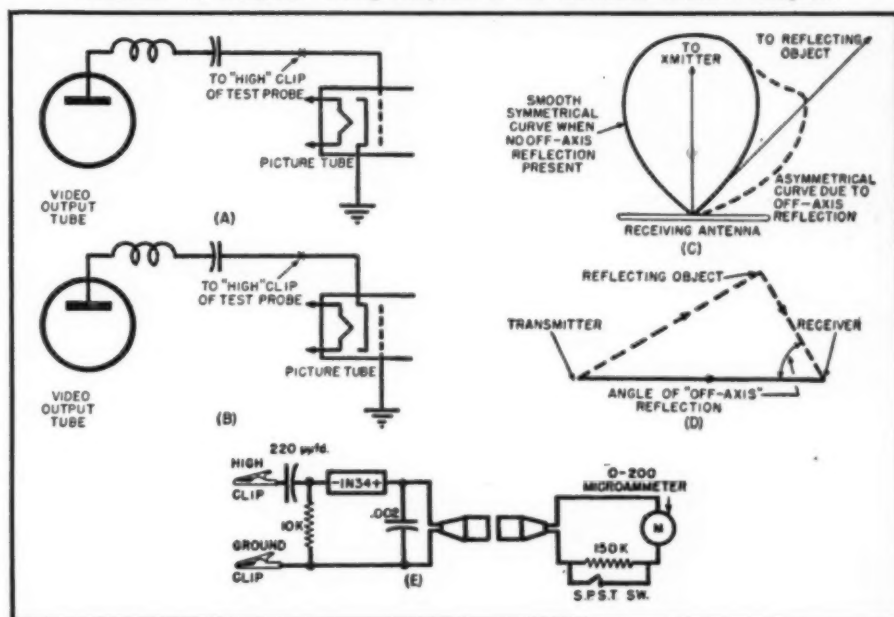
found not to be the case, due to erroneous choice of the test channel, the procedure can be repeated, although this is seldom necessary. By comparing maximum meter readings between various stations, a relative idea of their input to the receiver may be had, although this is not necessarily a direct indication of their field strength, since the antenna itself (and the receiver), may be working more effectively on one channel than on another. A ready means of comparing various antenna designs is also available by

the use of this instrument, since an actual meter-reading comparison can be made, rather than trusting to personal opinion.

All of the above assumes a constant transmitted signal from the station and a constant gain in the receiver itself. Therefore, it is important that any actual quantitative work be done only while a test pattern is being received, since varying picture content will naturally give varying meter readings. (The meter reading is proportional to the picture modulation and not to the video carrier.) Also, changing the setting of the gain control or abnormal drifting of the receiver will give non-comparable indications. The reasons for this are quite obvious.

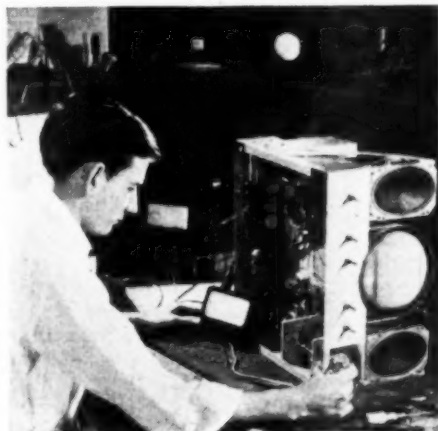
It should also be mentioned that if the receiver has automatic gain control (a.g.c.) in the video channel, this (Continued on page 136)

Fig. 1. (A) Illustrating where the "high" clip terminal of test probe is connected in a typical grid drive TV receiver, such as the Crosley 9-408. (B) "High" clip. terminal connection in a typical cathode drive TV receiver, such as the Admiral 19A series. (C) Distortion of symmetry due to off-axis reflection. (D) Off-axis reflection. (E) Complete wiring diagram of the television antenna compass.



The peaking of r.f. and oscillator sections in a TV receiver can be done on the bench, using this easy-to-build test unit.

The TV antenna compass and probe assembly. This is all the equipment necessary to orientate your TV antenna.



TV ghosts are usually considered the result of signal reflections—but there are other factors that can bring about identical ghost images.



Typical ghost as seen on kinescope screen. This can be caused by multi-path reception, line mismatch, or improper receiver adjustment.

Elimination of Reflections on Video Lines

By

C. A. MEYER and R. G. MIDDLETON

Tube Dept., Radio Corporation of America

TELEVISION "ghosts" may arise from several causes. One type of ghost is caused by reception of two or more signals from the same transmitting station. The desired signal travels, in most cases, by direct line-of-sight, while the undesired signal is reflected and delayed along its course. Reflection can take place from buildings, cliffs, suspension bridges, or other large structures, man-made or natural. The reflected signal is delayed with respect to the line-of-sight signal because it travels a longer path, and thereby causes a displaced or ghost image on the television screen.

A second type of ghost is caused by a mismatch of the television line to the receiver input circuit. When the impedances of the line and the receiver input circuit differ, not all of the available signal energy is delivered to the receiver. Instead, a portion of the incoming energy is reflected from the receiver back up the line to the antenna. This diverted energy is usually

re-reflected from the antenna terminals back down the line to the receiver, where it causes a displaced secondary image or ghost. When the mismatch between the receiver and the line is very bad, several ghosts can be observed because the signal "bounces" back and forth several times along the transmission line between the antenna and the receiver.

A third type of ghost can result from impaired receiver operation when the video intermediate-frequency amplifier or video amplifier is improperly adjusted. This type of ghost, however, is infrequent.

The first type can be minimized or eliminated, in many cases, by suitable orientation and positioning of a directional antenna. In poor receiving locations, however, it may be impossible to attenuate this type of ghost signal to a level where it is unobjectionable. No other method as yet is commercially available which can eliminate ghosts in such situations.

This article is primarily concerned with the elimination of the second type of ghost: that caused by a mismatch between the transmission line and the receiver input circuit. It should be observed that while a line can be practically matched to a receiver for operation on all television channels, it is not possible to match a line to an antenna over a wide band of frequencies. Hence, a match is sought only at the receiver input terminals. Fortunately, a match at this point suffices for satisfactory, ghost-free reception.

Mismatch arises in practice from several situations. In the case of older installations, consideration may not have been given to matching requirements, and a line may have been used which has a widely different impedance from the impedance of the receiver input circuit. When an old television receiver is traded in on a new receiver, the customer usually fails to consider possible differences in receiver input systems. In some cases, coaxial lines are installed on the assumption that they will help minimize severe noise pickup at street level; but, since coaxial lines have a considerably lower characteristic impedance than that of many standard receivers, a mismatch may be encountered. In other cases, the line is selected to "match" the antenna impedance instead of the receiver impedance. This selection, however, is based upon incorrect conceptions and frequently leads to reflections along the line.

Determination of Source of Ghost

When ghosts are observed on the kinescope screen, it becomes necessary at the outset to distinguish between displaced images caused by multi-path reception, and those caused by line mismatch. These two types of ghosts can frequently be distinguished by switching the television receiver from one station to another. If ghosts are observed on one channel, but not on the other channels, multi-path reception is indicated.

If a reflecting surface is so situated that multi-path reception could be expected from all stations, the switching test will be inconclusive. In such a case, or if only one television station can be received at the time, the chart shown in Fig. 1 usually suffices to distinguish between ghosts caused by multi-path reception and those caused by line mismatch.

The chart is further useful because the switching test may be inconclusive even if more than one station is available. To obtain a mismatch ghost, a mismatch condition must exist at both

antenna and receiver. Usually, in one channel, the antenna will practically match the line, although a mismatch exists in all other channels. Accordingly, a switching test might lead to the erroneous conclusion that a multi-path ghost is present, when, as a matter of fact, line reflection is taking place. Reference to the chart, however, will answer the question conclusively.

The displacement of a ghost image on a kinescope screen depends on the horizontal sweep width and upon the time delay between desired and undesired signals. This time delay has a definite relation to line length in the case of mismatch reflection, and a definite relation to path-length difference in the case of multi-path reception. In the case of line mismatch, the duration of the delay also depends upon the type of line used.

Because a multi-path ghost is considerably more displaced than a mismatch ghost (unless an unusually long line is used), differentiation is possible upon this basis. Furthermore, when a mismatch ghost is present, its displacement on the kinescope screen will check closely with the value found from Fig. 1 with respect to horizontal sweep width, type of line, and line length.

To use this chart, adjust the horizontal sweep width to correspond with the nearest value given in Fig. 1; measure the amount of displacement (leading edge of main image to leading edge of first ghost); and determine or estimate the length of the antenna transmission line. Find the displacement (D) on the vertical axis of Fig. 1 and the line length (L) on the horizontal axis. If the intersection of these two coordinates is approximately on the diagonal for the sweep width and type of transmission line used, then one may reasonably assume that the ghost is caused by a mismatch.

Let us take the following example: A displacement of 0.15 inch is observed on a 10BP4 10-inch kinescope; the sweep width is 8 inches; approximately 325 feet of RG-58/U coaxial cable connects the receiver to the antenna. Since L and D nearly intersect on the RG-58/U line for a 10-inch tube, the conclusion is drawn that the ghost is caused by mismatch. If the line is short and displacement of the ghost image is very small, it may not be possible to measure this displacement on the screen. The effect in this case is that of "fuzziness" or loss of definition and detail.

Matching Considerations

Representative impedances for both receiver and line are shown in Table 1. It is evident that mismatch difficulties may arise from installation of unsuitable lines, changing receivers, or mixing balanced and unbalanced systems. Television receivers have either balanced or unbalanced input systems, as diagrammed in Fig. 3. The unbalanced input system requires a coaxial line for proper operation; the balanced

(A)	
TYPE OF LINE	CHARACTERISTIC IMPEDANCE
Twin Lead	300, 150, 75 ohms
Coaxial RG-8/U, RG-58/U	53 ohms
Coaxial RG-11/U	75 ohms
Twisted Pair	Large Variation

(B)		
Receiver	Input Circuit Impedance	Type of Input
Admiral	300 ohms	Balanced
Andrea VII2	72 ohms	Unbalanced
Belmont	300 ohms	Balanced
Bendix	300 ohms	Balanced
Consolidated	72 ohms	Balanced
Crosley 9-408	300 ohms	Balanced
Crosley 9-407 M	72 ohms	Unbalanced
Du Mont	72 ohms	Unbalanced
Emerson	300 ohms	Balanced
Fada	300 ohms	Balanced
Farnsworth	300 ohms	Balanced
Garod	300 ohms	Balanced
G-E 802	300 ohms	Unbalanced
G-E 810	300 ohms	Balanced
Hallcrafters	300 ohms	Balanced
Industrial TV, Inc.	72 ohms	Unbalanced
Magnavox	300 ohms	Balanced
Motorola	300 ohms	Balanced
National	300 ohms	Balanced
Philco	300 ohms	Balanced
Pilot TV37	300 ohms	Balanced
RCA	300 ohms	Balanced
Scott	72-75 ohms	Unbalanced
Stewart-Warner	300 ohms	Balanced
Stromberg-Carlson	72 ohms	Unbalanced
Tele-Tone	300 ohms	Balanced
U. S. TV Mfg. Co.	100 ohms	Balanced
Westinghouse	300 ohms	Balanced

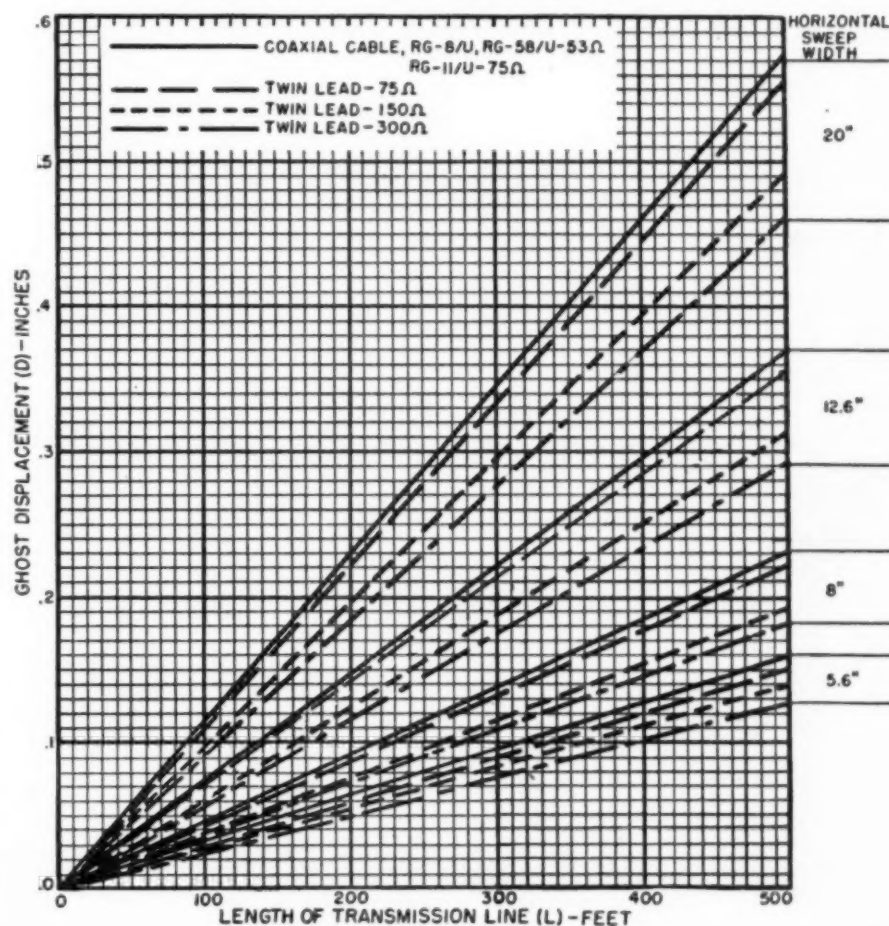
Table 1. (A) Characteristic impedance of several types of television transmission lines. (B) Characteristics of television receiver input circuits.

input requires a twin line (shielded or unshielded). A pair of coaxial lines, or a shielded balanced line provides a shielded balanced input. A twin-lead

line provides an unshielded and balanced input.

Receivers with balanced input systems should be operated from bal-

Fig. 1. Chart may be used to determine whether ghost images appearing on television screens are caused by multi-path reception or by line mismatch.



RECEIVER IMPEDANCE (OHMS)	LINE IMPEDANCE (OHMS)				
	53	75	106	150	300
72	$R_1 = 36$ $R_2 = 100$		$R_1 = 62$ $R_2 = 130$	$R_1 = 110$ $R_2 = 100$	$R_1 = 270$ $R_2 = 82$
100	$R_1 = 68$ $R_2 = 75$	$R_1 = 47$ $R_2 = 150$		$R_1 = 91$ $R_2 = 180$	$R_1 = 240$ $R_2 = 130$
150	$R_1 = 120$ $R_2 = 68$	$R_1 = 100$ $R_2 = 100$	$R_1 = 82$ $R_2 = 200$		$R_1 = 220$ $R_2 = 220$
300	$R_1 = 270$ $R_2 = 56$	$R_1 = 270$ $R_2 = 82$	$R_1 = 240$ $R_2 = 130$	$R_1 = 220$ $R_2 = 220$	

All resistance values are in ohms.
(Pad resistances given in nearest five per-cent RMA preferred values.)
Example: A 300-ohm twin line is to be matched to a 75-ohm balanced receiver.
From table, $R_1 = 270$ ohms, $R_2 = 82$ ohms, $\frac{1}{2}R_1 = 135$ ohms.
Pad arrangement is obtained from Fig. 2A.

Table 2. Various pad arrangements required when antenna-receiver mismatch occurs.

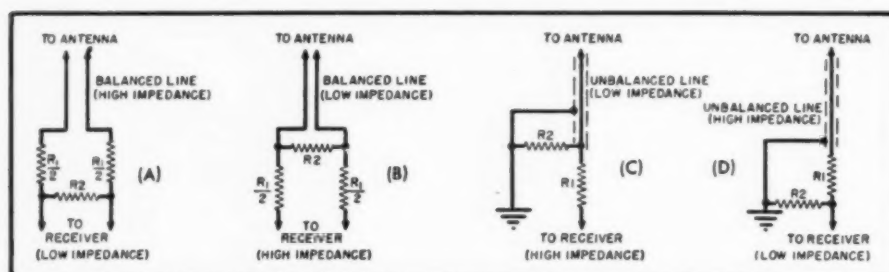


Fig. 2. Pad arrangements for balanced and unbalanced systems.

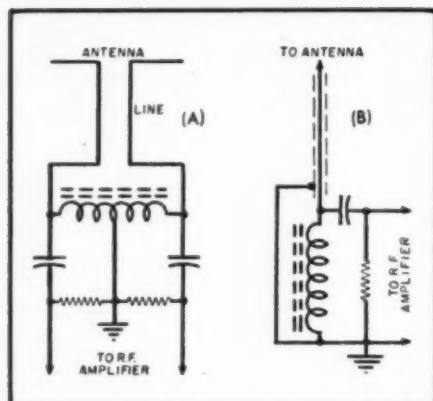
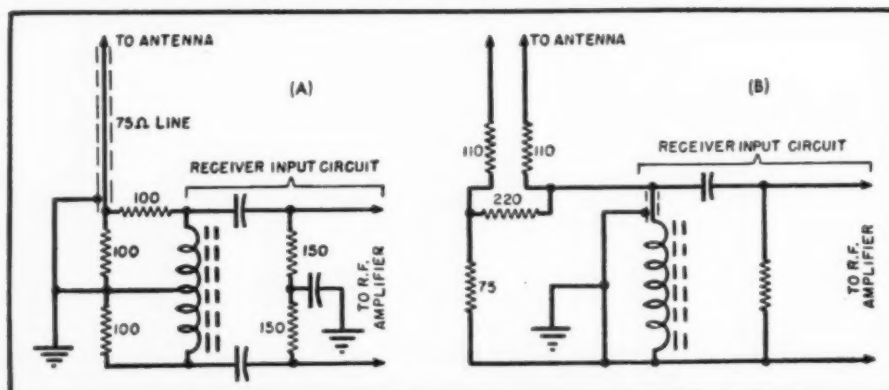


Fig. 3. Conventional balanced input circuit (A) and unbalanced circuit (B).

Fig. 4. (A) An unbalanced line matched to a balanced receiver input circuit. (B) A balanced line matched to an unbalanced receiver input circuit.



the line and the receiver input terminals. At television frequencies, both the line impedance and the receiver impedance are resistive for all practical purposes. Accordingly, simple resistive pads serve the purpose and maintain a practical match over all television channels. An unavoidable power loss, however, is the price which must be paid for ghost-free reception, when pads are used. If this insertion loss cannot be tolerated because of low signal level, the only remaining solution is to install a new transmission line which has the same characteristic impedance as the receiver. In many cases, however, the insertion loss of the pad can be tolerated.

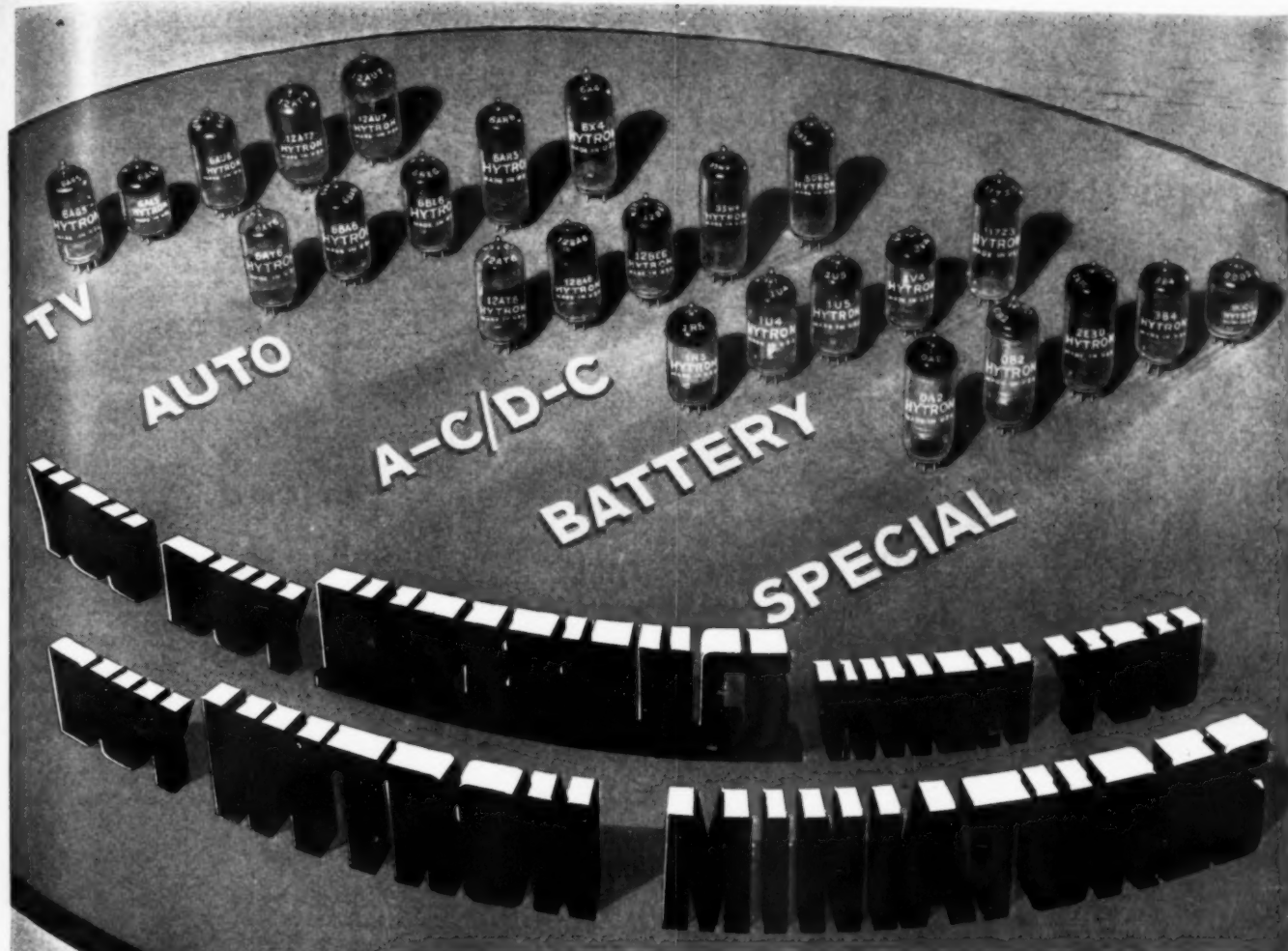
To obtain proper impedance relations with minimum insertion loss, L-type pads are recommended. In the case of receivers with balanced input circuits, half the total series resistance (see Fig. 2) is placed in each side of the line. For receivers with unbalanced input circuits the total series resistance is placed in the "hot" side of the line.

The question is sometimes asked why both series and shunt resistors are used to make up a pad. The answer is that two conditions are to be met: the line should "see" its own impedance when looking into the pad-plus-receiver, and the receiver should "see" its own impedance when looking into the pad-plus-line. The reason for the first condition has been explained above. If the receiver does not "see" its own impedance, the input circuit may be disturbed with corresponding impairment of performance.

When a pad is designed, reference should be made to Fig. 2 to determine the required circuit. The series resistance is placed in the high-impedance side of the system. In addition, the total series resistance is placed in the "hot" side of an unbalanced line, but in a balanced line, half the total series resistance is placed in each side. The shunt resistance is placed across the low-impedance side of the system.

Next, the values of R_1 and R_2 are determined. If the impedances of both the line and receiver are known, the resistance values can be found from Table 2. If the impedances are unknown, the values may be found by experiment. To determine the values of R_1 and R_2 experimentally, two (or three) potentiometers having at least 300 ohms of resistance are hooked up into the required pad circuit. Only carbon-type potentiometers should be used because wirewound elements have excessive inductance. The settings of the potentiometers are varied until the ghost disappears. Adjustment of the contrast control may be required to maintain satisfactory picture brightness. The values of potentiometer resistance are then measured with an ohmmeter, and the nearest values of small fixed carbon resistors are made up into a pad and permanently installed.

Inspection of Table 2 shows that
(Continued on page 98)



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BC-645 420-Mc. Transmitter/Receiver
BC-453A Series Receivers
BC-457A Series Transmitters
SCR-522 144-Mc. Transmitter/Receiver
TBY Transceiver with Xtal Control
PE-103A Dynamo
BC-1068A V-h-f Receiver
Electronics Surplus Index
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VOLUME II

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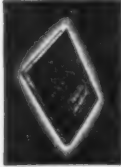


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The efficiency of class B linear amplifiers and of class C grid-modulated stages is about 30%; that of cathode-modulated amplifiers about 55%. This means that the class B linear and the class C grid-modulated finals will give about 300 watts output with the legal input of 1 kw., while the cathode-modulated final will give about 550 watts output for 1 kw. input. So far, so good. That's all right, we say, because surplus tubes and equipment are cheap and we make a big saving on modulation equipment. Furthermore, the decibels difference between a 550 watt cathode-modulated carrier and a 750 watt plate-modulated carrier hardly is worth the higher cost of plate modulation. But the picture is not as rosy as it appears at first glance—and plate dissipation

of the tube is the fly in the ointment.

Plate dissipation puts a limit on the maximum amount of power we can put into the EM final. We cannot just dump 1000 watts into a tube rated to take that much input, and then take out 300 watts of r.f. unless the plate dissipation rating is high enough to "take" the remaining 700 watts difference. In the case of a cathode-modulated final running at 1 kw. input, the plate must dissipate the 445 watts difference!

There is a certain maximum amount of power which any tube will handle safely in an efficiency-modulated amplifier without exceeding the plate dissipation. And we should not exceed that input value. What we can do with a surplus tube in an EM final depends, therefore, upon the plate dissipation of the tube.

For the convenience of the reader, the accompanying table has been prepared to show the highest EM input power and corresponding output power for 20 of the most suitable surplus tubes. No tube has been included in this list if its dissipation figure is lower than 100 watts. The wattages in the table are for single tubes. Twice as much input and output can be expected with two tubes in push-pull or parallel.

—50—

Highest EM input power and corresponding output power for twenty popular tubes.

TUBE TYPE	CLASS C GRID MOD. or CLASS B LINEAR		CATHODE MOD.	
	Input	Output	Input	Output
100TH	150	50	333	183
VT127A	150	50	333	183
204A	375	125	555	305
211	150	50	333	183
250TH				
250TL	375	125	555	305
304TH				
304TL	450	150	666	366
450TH	675	225	1000	555
527	450	150	666	366
805	187	62.2	278	154
806	337	112	500	275
810	225	75	334	184
813	150	50	333	183
822	300	100	445	245
833A	675	225	1000	555
838	150	50	333	183
845	150	50	333	183
852	150	50	333	183
860	150	50	333	183

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Beautiful mahogany cabinet for FM Tuner (shown above) extra **\$3.75**

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1. Measures each element individually.
2. Has gear driven roller chart.
3. Has lever switching for speed.
4. Complete range of filament voltages.
5. Checks every tube element.
6. Uses latest type lever switches.
7. Uses beautiful shatterproof full view meter.
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Check the features and you will realize that this Heathkit has all the features you want. Speed — simplicity — beauty — protection against obsolescence. The most modern type of tester — measures each element — beautiful Bad-Good scale, high quality meter — the best of parts — rugged oversize 110 V. 60 cycle power transformer — complete set of sockets for all type tubes including blank spare for future types — fast action gear driven roller chart uses brass gears to quickly locate and set up any type tube. Short and switching cuts necessary time to minimum and saves valuable service time. The Heathkit open element check. No matter what arrangement of tube elements, the Tube Checker flexible switching arrangement easily handles it. Order your Heathkit — all the quality — today. See for yourself that Heathkit again saves you 2/3 and yet retains all the quality — this tube checker will pay for itself in a few weeks — better build it now.

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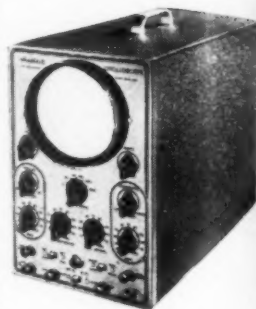
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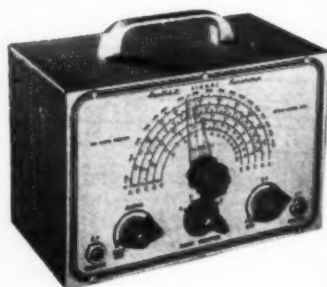
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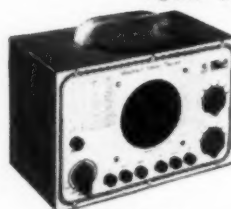
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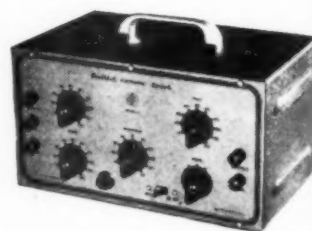
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An electronic switch used with any oscilloscope provides two separately controllable traces on the screen. Each trace is controlled independently and the position of the traces may be varied. The input and output traces of an amplifier may be observed one beside the other or one directly over the other illustrating perfectly any change occurring in the amplifier. Distortion — phase shift and other defects show up instantly. 110 Volt 60 cycle transformer operated. Uses 5 tubes (1 6X5, 2 6SN7's, 2 6SJ7's). Has individual gain controls, positioning control, and coarse and fine sweeping rate controls. The cabinet and panel match all other Heathkits. Every part supplied including detailed instructions for assembly and use. Shipping Wt., 11 lbs.



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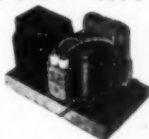


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- Measures leakage
- Checks paper-mica electrolytics

Checks all types of condensers, paper-mica-electrolytic-ceramic over a range of .00001 MFD to 1000 MFD. All on readable scales that are read direct from the panel. NO CHARTS OR MULTIPLIERS NECESSARY. A condenser checker anyone can read without a college education. A leakage test and polarizing voltage for 20 to 500 volts provided. Measures power factor of electrolytics between 0% and 50%. 110 V. 60 cycle transformer operated complete with rectifier and magic eye tubes, cabinet, calibrated panel, test leads and all other parts. Clear detailed instructions for assembly and use. Why guess at the quality and capacity of a condenser when you can know for less than a twenty dollar bill. Shipping Wt., 7 lbs.



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NO. 277. Husky army type 1 1/4" diameter, 3 1/4" long. Brown porcelain. Shipping Wgt. 4 lbs. **4 FOR \$1.00**



G.E. BC 306 ANTENNA TUNING UNIT

NO. 231. Matches any aerial to 150 Watt transmitter, used on BC 375. Brand new. Add postage for 20 lbs. **\$2.95**



G. E. 1,000 VOLT 350 MA DYNAMOTOR

NO. 213. An ideal dynamotor for mobile operation in taxicabs, police cars, sound systems and amateur stations. Supplies above voltage from 12 Volts or 500V. at 350 MA from 6 Volts. Complete with starting relay, and fuses. New. Our Dynamotor A. Shipping Weight 72 lbs. **\$5.95**



POWER TRANSFORMER Specials



NO. 226. Primary 117V. 60 cycle. Secondaries supply 746 V.C.T. at 220 MA, 6.3V. at 4.5 A., and 5V. at 4A. Will handle 13 tube radio receivers. Supply is limited, order early. Shipping Weight 11 lbs. each. **\$3.95 . . . 3 for \$9.95**

T32 TABLE MICROPHONE

NO. 210. One of the Army's best. Built by Kellogg, ideal for factory call system, public address, amateur use. Brand new in original cartons. Add postage for 5 lbs. **\$2.95**



MINIATURE ELECTRIC MOTOR

NO. 211. Tiny Delco motor only 1" x 1 1/4" x 2". 10,000 RPM. Operates from 6 to 24 V. Excellent for models. Add postage for 1 lb. **\$2.95**



OUTPUT TRANSFORMER

NO. 227. Push pull 6V6's to 6-8 ohm voice coil excellent characteristics. **3 for \$1.95**



RCA SATURABLE REACTOR TRANSFORMER

NO. 246. New RCA No. CKV30531 AC current 750 MA DC current 2 Amperes. Rated 1.75 henries. Shipping wgt. 4 lbs. Each **\$1.00**



12.6V POWER TRANSFORMER

NO. 247. New cased 110 V 60 cy. Power Transformer. Supplies 440V Ct. at 60 MA, 6.3V at 2A. and 12.6V at 1 Amp. Excellent for military sets. Shipping Wgt. 6 lbs. Each. **\$1.95**



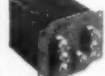
RCA INPUT TRANSFORMER

NO. 248. Heavy duty RCA No CKV-30529. Input has primaries 600 to 200 and 25 ohms secondary 250,000 ohms C.T. Shipping Wgt. 2 lbs. Each **\$1.00**



FEDERAL POWER TRANSFORMER

NO. 252. New cased 110V 60 cy. Power Transformer. Supplies 480V CT at 50 MA and 6.3 V at 2.1 Amps. A beautiful transformer. Shipping Wgt. 4 lbs. Each **\$1.50**



MILITARY POWER TRANSFORMERS

NO. 229. Convert your military receivers without rewiring the filament. "A" type supplies 500 VCT at 50 MA. 5V. at 2A. and 24V. at 1/2 A. "B" type supplies 500 VCT at 50 MA. 5V. at 2A. and 12V. at 1 Amp. State whether A or B type desired. **\$2.95** Shipping Weight 4 lbs.



WALKIE TALKIE TRANSFORMER

NO. 744. Carbon microphone input transformer and output to head-phone transformer, all in one case, excellent for building your own. Shipping Wt. 1 lb. **4 for \$1.00**



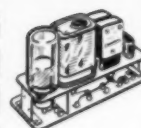
LOW PASS FILTER UNIT

NO. 637. 3000 cycle cutoff consists of 3 inductances and 4 capacitors in network, 500 ohms in and out. Excellent for clipping all frequencies above 3000 cycles. Drawn steel case, shipping Wt. 5 lbs. **\$2.50**



FM PUSH BUTTON TUNER

NO. 224. Brand new ten push button tuning assembly from Army FM receiver. Contains 4 gang 100 MMF silver plated tuning condenser. Add postage for 10 lbs. **\$2.50** EACH



BC 746 TUNING UNIT
NO. 257. Plug in transmitter tuning unit from army Walkie Talkie. Contains antenna and tank coils, tuning condenser, transmitting and receiving crystals. Ideal transmitter foundation. Shipping Wgt. **\$1.00** 1 lb. Each
(Same as above except transmitter crystal in 80 meter amateur band \$2.50 each)

T30 THROAT MICROPHONE

NO. 258. Makes excellent contact microphone for musical instrument or vibration pick-up. Shipping Wgt. 1 lb. **\$1.00** each
Extension cord with switch for above **\$.50** each



BC731 CONTROL BOX

with Weston Model 476 AC Voltmeter
NO. 208. Excellent buy in motor control box. Size 8" x 10" x 5 1/2". Contains Weston 0-150V. AC 3 1/2" voltmeter, motor starting switch, 28 fuses all 30 Amp 110V. and 8 fuse holders. Fuses and holders alone worth the price. Shipping Weight 18 lbs. **\$7.95**



METER SPECIAL

NO. 237. Brand new DeJur Model 312 0-800 M.A. D.C. Square 3" 0-10 M.A. basic meter with built in shunt. Probably the best buy ever offered in a surplus meter. Shipping Weight 1 lb. **\$2.95**



HEARING AID HEADPHONES

NO. 216. The Army's best - eliminate flat ears and outside noise. Complete with transformer for conversion from low to high impedance. With cord and plug complete. Add postage for 1 lb. **\$1.00**



BC 451 CONTROL BOX

NO. 236. Control box for 274N transmitters. Contains proper c-w voice switch, 4 channel switch, power switch, mike jack and telegraph key. Add postage for 2 lbs. **\$1.95**



100 MA FILTER CHOKE

NO. 641. Heavy 1.5 henry choke in drawn steel case, 50 ohm resistance, conservatively rated at 100 MA. Shipping Wt. 1 lb. **50c**



FILAMENT TRANSFORMER

NO. 922. 220V. 60 cy. primary supplies 12.6V. at 3.5 Amps, 15.6V at 1 Amp. Supplies 6.3 at 3.5 Amps and 7.8V. at 1. Amp from 110V. Shipping Wt. 8 lbs. **\$1.50**



PANEL METER

Burlington O-300 VAC Meter
NO. 290. Model 32XA 3 1/2" round AC Voltmeter O-300 VAC full scale. Scale also calibrated 0-600V. Bakelite case. A beautiful meter in original carton. Shipping Wt. **\$3.95**



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NO. 651. Couples 3000 ohm plate to push pull parallel grids hermetically sealed. Ship. Wt. 1 lb. **\$1.00**



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NO. 745. Companion transformer to above driver. A push pull output, 3000 ohms to 3.2 ohm voice coil, or to 1250 ohms at 80 MA. A high quality cased unit. Shipping Wt. 2 pounds. **\$1.00**



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TENTATIVE PROGRAM OF EVENTS

1949 RADIO PARTS AND ELECTRONIC EQUIPMENT SHOWS, INC.

SUNDAY, MAY 15th

- 9:00 a.m. Exhibition Hall open for erection of displays
Sales meetings should be held on this day and prior days

MONDAY, MAY 16th—"ASSOCIATIONS' MEETING DAY"

- 9:00 a.m. Exhibition Hall open for erection of displays
10:00 a.m. National Electronic Distributors Association—General Meeting
10:30 a.m. "The Representatives" of Radio Parts Mfrs., Inc.—General Meeting
12:00 Noon "Canadian Luncheon"—Radio Parts Sales Managers Ass'n. of Canada
12:30 p.m. "The Representatives" of Radio Parts Mfrs., Inc.—Luncheon
2:00 p.m. Sales Managers Club, Eastern Division, Ass'n. of Electronic Parts & Equipment Mfrs., and West Coast Electronic Mfrs. Ass'n.—Joint Meeting
2:30 p.m. "The Representatives" of Radio Parts Mfrs., Inc.—Delegates Meeting
3:30 p.m. Radio Parts & Electronic Equipment Shows, Inc.—Annual Meeting of Member-Exhibitors and General Members
6:30 p.m. "Old Timers" Cocktail Party

TUESDAY, MAY 17th—"NEDA DAY" (Exclusive)

- 10:00 a.m. Exhibition Hall opens for exhibiting manufacturers, booth attendants sales representatives and members of Nat'l. Electronic Distributors Ass'n.
10:00 a.m. Display rooms on fifth and sixth floors open to all distributors, manufacturers and sales representatives
6:00 p.m. Exhibition Hall and Display rooms close

WEDNESDAY, MAY 18th

- 10:00 a.m. Display rooms on fifth and sixth floors open to all distributors, manufacturers and sales representatives
10:00 a.m. Exhibition Hall opens
10:00 a.m. to 1:00 p.m. Attendance confined to exhibiting manufacturers, their booth attendants, sales representatives and members of NEDA
1:00 p.m. to 3:00 p.m. Attendance confined to exhibiting manufacturers, their booth attendants, sales representatives and all distributors
3:00 p.m. to 6:00 p.m. Attendance confined to exhibiting manufacturers, their booth attendants, sales representatives, all distributors, industrial manufacturers, government agencies, their purchasing agents and engineers
6:00 p.m. Exhibition Hall and Display rooms close

THURSDAY, MAY 19th

- 10:00 a.m. Display rooms on fifth and sixth floors open to all distributors, manufacturers and sales representatives
10:00 a.m. Exhibition Hall opens
10:00 a.m. to 1:00 p.m. Attendance confined to exhibiting manufacturers, their booth attendants, sales representatives and members of NEDA
1:00 p.m. to 3:00 p.m. Attendance confined to exhibiting manufacturers, their booth attendants, sales representatives and all distributors
3:00 p.m. to 6:00 p.m. Attendance confined to exhibiting manufacturers, their booth attendants, sales representatives, all distributors, industrial manufacturers, government agencies, their purchasing agents and engineers
6:00 p.m. Exhibition Hall and Display rooms close
7:00 p.m. Dinner—RMA's "Silver Anniversary" Banquet, Grand Ballroom, Stevens

FRIDAY, MAY 20th

- 10:00 a.m. Display rooms on fifth and sixth floors open to all distributors, manufacturers and sales representatives
10:00 a.m. Exhibition Hall opens
10:00 a.m. to 1:00 p.m. Attendance confined to exhibiting manufacturers, their booth attendants, sales representatives and members of NEDA
1:00 p.m. to 3:00 p.m. Attendance confined to exhibiting manufacturers, their booth attendants, sales representatives and all distributors
3:00 p.m. to 6:00 p.m. Attendance confined to exhibiting manufacturers, their booth attendants, sales representatives, all distributors, industrial manufacturers, government agencies, their purchasing agents and engineers
6:00 p.m. Exhibition Hall and Display rooms close
1949 Radio Parts & Electronic Equipment Conference & Show ends

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Complete, practical data on MAGNETIC RECORDING



BY S. J. BEGUN

Chief Engineer, The Brush
Development Co.

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\$5.00

Here at last is the "low down" on one of the fastest growing electronic developments in all of its design, engineering, and experimental phases. MAGNETIC RECORDING acquaints you with every detail of modern equipment, brings you the latest information on applications ranging from home entertainment to movies, broadcasting, professional and amateur radio and special uses such as military speech scrambling.

All about the theory, types, and makes of recorders, their applications and performance measurement

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2. Acoustic Factors
3. Magnetism
4. Theory of Magnetic Recording
5. Components of a Magnetic Recording System
6. Magnetic Recording Equipment
7. Applications of Magnetic Recording
8. Instrumentation and Magnetic Recording Measurements
9. The Magnetic Phonograph
10. Helpful Glossary of Magnetic Recording Terms

IT PAYS TO STUDY THE NEW DEVELOPMENTS!

Acoustic and magnetic factors are carefully explained. A-C and D-C biasing methods, distortion factors, reproducing heads, drive mechanisms and the various recording media and methods of recording, reproducing, and erasing are discussed in detail. Particularly valuable are a complete outline of recording devices and how they are used; a helpful study of instruments for determining recording performance; and a clear discussion of magnetic versus other recording methods. More than 130 diagrams and illustrations make things easily understandable. Use coupon for 10 days' free trial.

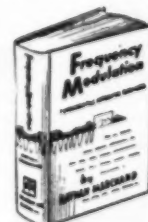
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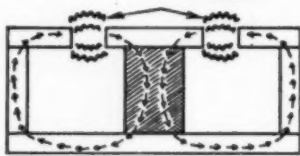


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Cross section illustration indicating the advantages of "Alnico V-Plus" super efficient magnetic assembly over the old type external ring magnets of conventional alloy, shaded portions of sketch indicate magnetic material "Alnico V-Plus" offers an energy content per unit volume three times as great as any magnet used before!

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DO YOU KNOW?

By DAVID SCOTT

54. What may be the result of variations in the velocity of the electron stream?

A. Variations in the velocity of the electron stream will cause defocusing. Since electrostatic deflection depends on the square of the electron velocity, whereas magnetic deflection depends only on the first power, this source of defocusing is more serious when electrostatic deflection is used.

55. What may be the result of the ion spot?

A. The result is a dark spot in the center of the reproduced picture.

56. In what type of deflection is the ion spot most troublesome?

A. In magnetic deflection the ion spot is quite apparent and eventually this continual bombardment of heavy ions on one spot will burn that portion of the screen. This is due to the fact that in magnetic deflection the deflection is inversely proportional to the square root of the mass of the particles. Since the ions have a mass of 1800 to 500,000 times that of the electron mass there is a correspondingly smaller deflection and they cluster in the center.

57. Define a saw-tooth waveform.

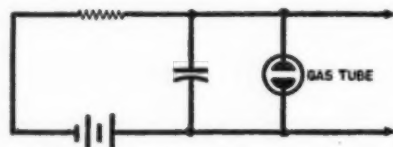
A. A saw-tooth waveform is one in which the deflection voltage or current increases linearly with time and decreases rapidly to its initial value.

58. What is the keystone effect?

A. In the iconoscope there is a 30 degree angle of the beam to the plate. Due to the difference in distance resulting from this angle from the top to the bottom of the plate by the scanning beam, an unequal amplitude of scanning results giving rise to a pattern keystone in shape.

59. Draw a simple schematic diagram illustrating and explaining methods of producing saw-tooth waves of voltage.

A. All methods used in television to produce saw-tooth waves are

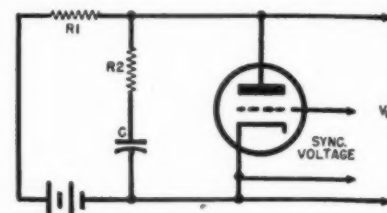


based on the slow charge of a condenser followed by its rapid discharge. A simple circuit for achieving this, though not used practically, is as follows: A tube with two electrodes immersed in gas at low

pressure is connected across the terminals of a condenser. As the voltage across the condenser increases, the gas tube remains non-conducting until a critical voltage is reached. Then the gas tube suddenly becomes conductive and discharges the condenser resulting in a saw-tooth wave. In order to exercise some control over the tube action a three element tube, gassy or hard, is used. The control grid is used to carry a synchronizing impulse which discharges the tube at a fixed rate.

60. Draw a simple schematic diagram illustrating and explaining methods of producing saw-tooth waves of current.

A. Saw-tooth waves from a condenser alone cannot be used to pro-



vide saw-tooth waves of current necessary in magnetic deflection. This is because the deflecting coils possess inductance and resistance. Hence, a current passing through them becomes distorted. Therefore a pre-distorted voltage must be applied to the coils to produce a saw-tooth wave of current. This "pre-distortion" is accomplished by placing a resistor in series with the condenser as shown in the diagram.

61. What are some of the necessary design qualities of voltage waveform amplifiers?

A. Voltage waveform amplifiers must be flat up to ten times the scanning frequency, i.e., $60 \times 10 = 600$ c.p.s in the vertical amplifier and $15,750 \times 10 = 157,500$ c.p.s. in the horizontal amplifier. The angular phase displacement of the sine wave components must be proportional to the frequency, and both deflecting plates must be symmetrically disposed with respect to the second anode to keep the field between the plates as uniform as possible.

62. What are the three important types of impulse generators?

A. Three important types of impulse generators are:

1. Dynatron
2. Multivibrator
3. Blocking oscillator.

(To be continued)

YOUR DOLLAR BUYS MORE AT MCGEE RADIO COMPANY

"COMPLETE AUDIO AMPLIFIER KIT AS LOW AS \$6.95"

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Gain for V.R. Pick-Up KIT MODEL TM-12. 12 watt amplifier kit. Ideal for high quality record player as well as public address or recording amplifier. Matched components. Gain enough for crystal or dynamic microphone. 100 mill power transformer, for 110 volt AC 60 cycle operation. Includes complete wiring diagram and photos. Weight 8 lbs. Kit TM-12. Net \$10.95.

8-Watt AC Amplifier Kit \$8.95 WITH PUSH PULL 6A05

A complete kit of parts to build a 8 Watt transformer type Audio Amplifier for 110 Volt AC operation. Inputs for mike and phono pickup either crystal or variable reluctance type. Variable tone and fader control. Output transformer matches 6 to 16 Ohm speaker. Ready punched chassis. Similar in appearance to Model TM-12 shown above. Price includes easy to follow wiring diagram and photos. Weight 8 lbs. Kit Model TM-8. Net \$8.95. Crystal Mike & Desk Stand \$4.95 extra. 12 Inch Alnico V PM Speaker \$4.95 extra.

5-WATT AMP. KIT \$6.95 PUSH PULL 50B5

A complete kit of parts to build a 5 Watt Audio AC-DC amplifier. Inputs for mike and phono pickup crystal or variable reluctance. Output transformer matches 4 to 16 Ohm speaker. Tone and fader controls. This is a complete kit with ready punched chassis and easy to follow wiring diagram. Everything included including tubes. 2-12A7, 2-50B5, plus selenium Rectifier. Offered at the usual low price of a single output tube. Kit Model TM-4. Weight 6 lbs. Net \$6.95. Crystal Mike and desk stand \$4.95 extra. 12 inch PM Speaker \$4.95 extra.

GAROD DELUXE 5-Tube Kit \$12.95

This is our latest and finest AC-DC radio kit. Receives Broadcast, 540 to 1650 KC. Has full length illuminated slide rule dial. Choice of Ivory or Walnut plastic cabinet. Full high efficiency 2 gang superhet circuit, with loop antenna. Ready punched chassis, full 5" PM speaker. Everything included. Shipping weight 9 lbs. Kit Model XA-49. Net \$12.95.

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WILL HOUSE CRP-15 KIT. Beautifully made walnut armchair cabinet. Outside dimensions 24" high, 16 1/2" deep and 27" wide. Ample room for radio receiver 14" long, 9" high, and 10" deep. Will hold a changer up to 14" square. Will accommodate speaker up to 12". Has record album storage compartment. Hinged lid covers changer compartment. Cabinet AR-13. Net price \$29.95. Crescent Deluxe changer \$14.95 extra. Armchair cabinet in blonde finish. Net price \$34.95.

A few items of war surplus are still available.

Brand new 458 5.3 to 7.1 MC trns. \$5.95

Used BC 458 with tubes \$2.95

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New BC 733D localizer rec. with tubes \$6.95

ARC-4 brand rec. 144MC used with tubes and dynamotor \$12.95

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Philco Mike same as Electrovoice 630 Dynamic High Z. 20 Ft. Cable. Regular. \$36.50. Scoop price, \$14.95, for \$41.95.

Philco Mike same as Electrovoice VI Velocity. High Z. 20 Ft. Cable. \$40.00 list. Price, \$14.95. 3 for \$41.95.

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SUPER DELUXE 30-WATT AMP. KIT \$19.95

A complete kit of parts to build a full 30 Watt Public Address Amplifier. Ready punched chassis with cover. 160 Mill Power Transformer, for 110 Volt AC operation. Inputs for two mikes and Crystal or Variable Reluctance Phono Pick up. Tone Control. Has heavy duty output transformer to match any speaker. 4-16-250 and 500 Ohms. Inverse Feed Back. Everything furnished including easy to follow diagram and tubes 2-6S17, 2-7N7, 2-6L6, 5V4. This makes a ready saleable amplifier of commercial quality. Kit Model TM-30. Weight 25 lbs. Net \$19.95. With HIFI Output Trans. \$25.00 Extra.

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Size 6 1/2 x 3 1/4 x 4 1/4—Weight 3 1/2 Lbs. Simple Assembly and Wiring Instructions

This kit is ready for immediate delivery. The same nationally known factory that manufactures tens of thousands of this radio, line producing this radio kit for us. Every part, from the cabinet down to the last resistor, is matched. The chassis is ready punched. All you do is mount parts and wire. This radio kit will assemble into a beautiful personal radio for you, just the same as it does for the factory. We furnish you a diagram, photograph of the completed chassis and full assembly instructions so that you with a minimum of radio knowledge may wire this kit. The beautiful case is made of metal with plastic hinged lid and snap-on back. The lucite face of the receiver has an inlaid gold design. The circuit is the conventional two gang superhet type with A.V.C. Receiver type with minimum 540 to 1650 KC. Uses miniature tubes: 1B5 converter, 1B5 detector A.V.C., 174 amplifier and 354 power amplifier. Alnico V PM speaker. The loop antenna is built in the lid. Radio comes on automatically when lid is opened. No cabinet. Extra care in pricing complete with tubes and 67 1/2 volt "B" battery and flash cell (Not AC-DC). Nothing else to buy.

Model X-45. Price \$14.95 Include Postage for 6 lbs. Scoop Model X-45 Personal Portable Kit Wired and Tested With Batteries. Net \$17.95.

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- 8-INCH SLIDE RULE DIAL • RECEIVES BROADCAST AND 19 to 49 METERS • PUSH PULL OUTPUT TUBES • BASS BOOST TONE CONTROL
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PRK-24. Radio-Amp. Kit with 12" P.M. speaker. With tubes. Net \$29.95

CRP-15. Exactly the same kit as the PRK-24 kit, except it is furnished with a 12" Choudograph wide range speaker. (Has built-in high frequency tweeter.) Net \$37.95

This is our finest kit.....

BUILD A RADIO WITH MATCHED "DETROLA" PARTS

6-TUBE 2-BAND KIT \$16.95

A complete kit of parts, tubes and ready punched chassis to build a fine 6 tube power transformer type radio chassis. (No cabinet.) We furnish every piece as well as a printed diagram and photograph. Chassis size 14x7x7. Receives standard broadcast and 6 to 16 MC foreign short wave. 3 gang tuning condenser used on both bands. 90 mill power transformer. 6V6 output tube. Heavy duty 8 inch speaker. This kit is made up of parts intended for use in a high quality Detroit radio. Has full lighted slide rule dial. Everything goes together just like a factory built radio. Priced complete with 6 tubes. Kit model 6-A.C. Weight 16 lbs. net \$16.95.

Kit model CD-8. Same basic design as the above model 6-A.C. except it is an 8 tube AC DC circuit with push pull 25L6 tubes in the audio. Weight 15 lbs. Priced complete with 8 tubes. Net \$18.95.

If you desire, we will sell just the chassis pan, slide rule dial, IF coils, RF and Ant coils and band switch for the model 6-A.C. kit. You supply all other materials. Diagram furnished. Stock No. B-14. Weight 7 lbs. Net \$6.95

COILS, IF'S—LOOPS

Universal slug tuned RF or ant coil for broadcast band. 5 for \$1.49

3 or 4 wire 456 osc. coil. 15c

Matched sets of 456 IF coils, per set. 90c

Either input or outputs. 40c

Small Medium or large loops. 30c

Matched set. 2 gang cond. loop ant. osc. coil and 2 IF special. 1.29

Pee Wee 456 IF input or output. 30c

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Kit Model TF-6C. Net \$9.95.

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4 tube AC-DC. TRF radio kit. Ideal for students and beginners. Every part furnished to build this kit, including tubes, diagram and photos. Has Alnico PM speaker and tubes. 12SK7, 12SK7, 50B5 and 35W4. Plastic cabinet with airplane dial. Receives broadcast 550 to 1600 KC. This is the easiest type of radio to build. Kit Model TF-4. Weight 6 lbs. Net \$6.95.

McGee's Theatre Quality AMPLIFIER KIT \$34.95

Our sales and engineering department, realizing that not every one can afford a \$100.00 audio amplifier, has designed a Theatre quality, 15 watt True-Fidelity Amplifier kit. Response essentially flat from 20 to 17,000 cycles. It contains every part, tubes and ready punched chassis. Has input for a crystal or dynamic microphone and gain and tone compensation for the new G.E. Variable Reluctance pickup as well as the conventional crystal pickups. A 4 step tone switch for tone equalization. This kit has a 34 watt Merit high fidelity, wax impregnated output transformer, with taps for 16, 32, 48, 64, 80, 96, 112, 128, 144, 160, 176, 192, 208, 224, 240, 256, 272, 288, 304, 320, 336, 352, 368, 384, 400, 416, 432, 448, 464, 480, 496, 512, 528, 544, 560, 576, 592, 608, 624, 640, 656, 672, 688, 704, 720, 736, 752, 768, 784, 800, 816, 832, 848, 864, 880, 896, 912, 928, 944, 960, 976, 992, 1008, 1024, 1040, 1056, 1072, 1088, 1104, 1120, 1136, 1152, 1168, 1184, 1200, 1216, 1232, 1248, 1264, 1280, 1296, 1312, 1328, 1344, 1360, 1376, 1392, 1408, 1424, 1440, 1456, 1472, 1488, 1504, 1520, 1536, 1552, 1568, 1584, 1600, 1616, 1632, 1648, 1664, 1680, 1696, 1712, 1728, 1744, 1760, 1776, 1792, 1808, 1824, 1840, 1856, 1872, 1888, 1904, 1920, 1936, 1952, 1968, 1984, 2000, 2016, 2032, 2048, 2064, 2080, 2096, 2112, 2128, 2144, 2160, 2176, 2192, 2208, 2224, 2240, 2256, 2272, 2288, 2304, 2320, 2336, 2352, 2368, 2384, 2400, 2416, 2432, 2448, 2464, 2480, 2496, 2512, 2528, 2544, 2560, 2576, 2592, 2608, 2624, 2640, 2656, 2672, 2688, 2704, 2720, 2736, 2752, 2768, 2784, 2800, 2816, 2832, 2848, 2864, 2880, 2896, 2912, 2928, 2944, 2960, 2976, 2992, 3008, 3024, 3040, 3056, 3072, 3088, 3104, 3120, 3136, 3152, 3168, 3184, 3200, 3216, 3232, 3248, 3264, 3280, 3296, 3312, 3328, 3344, 3360, 3376, 3392, 3408, 3424, 3440, 3456, 3472, 3488, 3504, 3520, 3536, 3552, 3568, 3584, 3600, 3616, 3632, 3648, 3664, 3680, 3696, 3712, 3728, 3744, 3760, 3776, 3792, 3808, 3824, 3840, 3856, 3872, 3888, 3904, 3920, 3936, 3952, 3968, 3984, 4000, 4016, 4032, 4048, 4064, 4080, 4096, 4112, 4128, 4144, 4160, 4176, 4192, 4208, 4224, 4240, 4256, 4272, 4288, 4304, 4320, 4336, 4352, 4368, 4384, 4400, 4416, 4432, 4448, 4464, 4480, 4496, 4512, 4528, 4544, 4560, 4576, 4592, 4608, 4624, 4640, 4656, 4672, 4688, 4704, 4720, 4736, 4752, 4768, 4784, 4800, 4816, 4832, 4848, 4864, 4880, 4896, 4912, 4928, 4944, 4960, 4976, 4992, 5008, 5024, 5040, 5056, 5072, 5088, 5104, 5120, 5136, 5152, 5168, 5184, 5200, 5216, 5232, 5248, 5264, 5280, 5296, 5312, 5328, 5344, 5360, 5376, 5392, 5408, 5424, 5440, 5456, 5472, 5488, 5504, 5520, 5536, 5552, 5568, 5584, 5600, 5616, 5632, 5648, 5664, 5680, 5696, 5712, 5728, 5744, 5760, 5776, 5792, 5808, 5824, 5840, 5856, 5872, 5888, 5904, 5920, 5936, 5952, 5968, 5984, 6000, 6016, 6032, 6048, 6064, 6080, 6096, 6112, 6128, 6144, 6160, 6176, 6192, 6208, 6224, 6240, 6256, 6272, 6288, 6304, 6320, 6336, 6352, 6368, 6384, 6400, 6416, 6432, 6448, 6464, 6480, 6496, 6512, 6528, 6544, 6560, 6576, 6592, 6608, 6624, 6640, 6656, 6672, 6688, 6704, 6720, 6736, 6752, 6768, 6784, 6800, 6816, 6832, 6848, 6864, 6880, 6896, 6912, 6928, 6944, 6960, 6976, 6992, 7008, 7024, 7040, 7056, 7072, 7088, 7104, 7120, 7136, 7152, 7168, 7184, 7200, 7216, 7232, 7248, 7264, 7280, 7296, 7312, 7328, 7344, 7360, 7376, 7392, 7408, 7424, 7440, 7456, 7472, 7488, 7504, 7520, 7536, 7552, 7568, 7584, 7600, 7616, 7632, 7648, 7664, 7680, 7696, 7712, 7728, 7744, 7760, 7776, 7792, 7808, 7824, 7840, 7856, 7872, 7888, 7904, 7920, 7936, 7952, 7968, 7984, 8000, 8016, 8032, 8048, 8064, 8080, 8096, 8112, 8128, 8144, 8160, 8176, 8192, 8208, 8224, 8240, 8256, 8272, 8288, 8304, 8320, 8336, 8352, 8368, 8384, 8400, 8416, 8432, 8448, 8464, 8480, 8496, 8512, 8528, 8544, 8560, 8576, 8592, 8608, 8624, 8640, 8656, 8672, 8688, 8704, 8720, 8736, 8752, 8768, 8784, 8800, 8816, 8832, 8848, 8864, 8880, 8896, 8912, 8928, 8944, 8960, 8976, 8992, 9008, 9024, 9040, 9056, 9072, 9088, 9104, 9120, 9136, 9152, 9168, 9184, 9200, 9216, 9232, 9248, 9264, 9280, 9296, 9312, 9328, 9344, 9360, 9376, 9392, 9408, 9424, 9440, 9456, 9472, 9488, 9504, 9520, 9536, 9552, 9568, 9584, 9600, 9616, 9632, 9648, 9664, 9680, 9696, 9712, 9728, 9744, 9760, 9776, 9792, 9808, 9824, 9840, 9856, 9872, 9888, 9904, 9920, 9936, 9952, 9968, 9984, 10000.

8-Tube Kit \$37.95

Model 814 Chassis made for silvertone. 8 tubes. 12B0, 14Q7, 14A7, 7C7, 2-50A5, 2-35Y4. 3 inch slide rule dial. Chassis size 11x8x8. 2 gang cond. receives standard broadcast. Tone control. Power trans. is mounted on small separate chassis to keep hum out of wire recording. Input on chassis for mike and phono pick up. Built in osc. circuit for use with any wire recording mechanism. This chassis is from the famous silvertone radio wire recorder. Price includes chassis, tubes and 10 inch speaker. Weight 25 lbs. Model 814. Net \$34.95.

8-TUBE WIRE RECORDER REC. CHASSIS \$35.95

Model 814 Chassis made for silvertone. 8 tubes. 12B0, 14Q7, 14A7, 7C7, 2-50A5, 2-35Y4. 3 inch slide rule dial. Chassis size 11x8x8. 2 gang cond. receives standard broadcast. Tone control. Power trans. is mounted on small separate chassis to keep hum out of wire recording. Input on chassis for mike and phono pick up. Built in osc. circuit for use with any wire recording mechanism. This chassis is from the famous silvertone radio wire recorder. Price includes chassis, tubes and 10 inch speaker. Weight 25 lbs. Model 814. Net \$34.95.

6-TUBE 2-BAND KIT \$16.95

A complete kit of parts, tubes and ready punched chassis to build a fine 6 tube power transformer type radio chassis. (No cabinet.) We furnish every piece as well as a printed diagram and photograph. Chassis size 14x7x7. Receives standard broadcast and 6 to 16 MC foreign short wave. 3 gang tuning condenser used on both bands. 90 mill power transformer. 6V6 output tube. Heavy duty 8 inch speaker. This kit is made up of parts intended for use in a high quality Detroit radio. Has full lighted slide rule dial. Everything goes together just like a factory built radio. Priced complete with 6 tubes. Kit model 6-A.C. Weight 16 lbs. net \$16.95.

5-TUBE BATTERY CHASSIS \$10.95

Chassis Model 801. A broadcast 5 tube straight battery operated chassis. Requires 11 1/2 volt A and 90 volts B. Similar in appearance to the model 810 pictured above. Size 12x5 1/2x7". 6 inch slide rule dial. 3 tuned stages RF stage. Tubes 1L6, 1L6, 1L6, 1L6, 1L6. Made for silvertone. Price includes chassis, tubes, 6 inch PM speaker. Model 801. Weight 12 lbs. Net \$10.95.

6-TUBE AC-DC CHASSIS \$10.95

Model 808. A broadcast 6 tube AC-DC receiver made for silvertone. Size 5 1/2x5 1/2x10". 5 inch slide rule dial. 2 gang tuning cond. Tone control. 6 inch speaker. Similar to picture above. Ideal for utility use. Tubes 7B7, 14Q7, 7B7, 7C6, 50A5 and 35Y4. Chassis tubes and speaker weight 13 lbs. Scoop price \$10.95.

RECORD PLAYER KITS \$9.95 AND UP

Capitol Portable Case

Deluxe Portable Record Player Kit housed in the attractive Capitol case. Includes all parts and easy to follow diagram. Has 4 Heavy Duty PM Speaker. 78 RPM Phone Motor. All necessary parts to build a 70.7 type Amplifier. Weight 14 lbs. Model CK-1. Net \$9.95.

Portable Player Kit for L.P. \$19.95

Complete Record Player with wired 4-Tube AC-DC Amplifier. Component parts shipped separately. 4x6" PM Speaker. Brown leatherette Capitol portable case with chrome trim case. Dual speed phonograph motor 33 1/3 and 78 RPM. 2 Pickup Arms. LP & Standard. Only a few minutes required for assembly. All you do is turn on. Stock No. LP-CCB. Net \$19.95. Weight 17 lbs.

AC-PORTABLE PLAYER \$19.95

Super deluxe record player with push-pull 7C5 A C type amplifier and 6 inch speaker. All you do is mount amp in the case. Case is of the accepted type. This player should sell for \$35.00. Stock No. DL-3. Net \$19.95.

Offered with Stewart-Warner automatic changer. Stock No. AR0-4. Net \$27.95.

4-TUBE PHONO AMP. \$7.95

4 Tube Phono Amplifier with 6", 3 1/2" Alnico V PM Speaker. 4 Tubes: 2-12Z5, 12X7, 12X7, and 35L6. Tone Volume Control. Small thin chassis. Made for a 2 1/2 mail order house. Plenty of power. Offered at less than production cost. Stock No. SR-4. Weight 7 lbs. Net \$7.95.

CHILDREN'S PLAYER KIT \$7.95

New children's electronic player. Offered in kit form. Includes all material necessary. Attractive plywood cabinet, self-starting phono motor and crystal pick-up. 4x6" PM speaker and parts to build 70.7 amplifier. Diagram included. Weight 8 lbs. Stock No. LJ-1. Net Price \$7.95.

1948 MODEL—MIKE-BROADCASTER KIT—ONLY \$6.95

4-TUBES

Broadcasts 400 to 1500 KC from either a phono-graph pick-up or a crystal or dynamic mike. Makes any radio receiver a P.A. system, record player or recording amplifier. Broadcast quality. Has fader control from mike to record, simulating a regular broadcast station. This is a powerful model using minimum 540 and 35W4. Priced with tubes and wiring diagram. Works on 110 volts AC-DC Crystal mike and desk stand \$4.95 extra. Complete Kit Model DE-4 truly a deluxe mike-phonograph oscillator. Weight 4 lbs.

\$59.50 VALUE MUSICAL AMP. \$24.95

8 watt Musical Amplifier. 4 tube AC transformer type. Proper gain for all instrument pickups. Housed in leatherette case with built-in 8" speaker. Gain and tone controls. Made by a large manufacturer to sell for \$59.50. Stock No. XR-3. Weight 25 lbs. Net Price \$24.95.

SCOOP SALE ON RADIO CHASSIS; 6 TUBES, 3-WAY \$14.95

Chassis Model 810-A. A deluxe broadcast 3-way 110 volt AC or DC or battery pack radio chassis, complete with 6 tubes, 6" slide rule dial and 6" PM speaker. 12x5 1/2 inch size. Made by No. 1 manufacturer for a top mail order house. Has tuned RF stage, giving high sensitivity and selectivity. A \$25.00 value for only \$14.95.

5-TUBE BATTERY CHASSIS \$10.95

Chassis Model 801. A broadcast 5 tube straight battery operated chassis. Requires 11 1/2 volt A and 90 volts B. Similar in appearance to the model 810 pictured above. Size 12x5 1/2x7". 6 inch slide rule dial. 3 tuned stages RF stage. Tubes 1L6, 1L6, 1L6, 1L6, 1L6. Made for silvertone. Price includes chassis, tubes, 6 inch PM speaker. Model 801. Weight 12 lbs. Net \$10.95.

6-TUBE AC-DC CHASSIS \$10.95

Model 808. A broadcast 6 tube AC-DC receiver made for silvertone. Size 5 1/2x5 1/2x10". 5 inch slide rule dial. 2 gang tuning cond. Tone control. 6 inch speaker. Similar to picture above. Ideal for utility use. Tubes 7B7, 14Q7, 7B7, 7C6, 50A5 and 35Y4. Chassis tubes and speaker weight 13 lbs. Scoop price \$10.95.

5-TUBE AC-DC CHASSIS \$9.95

5-Tube AC-DC chassis similar to the 6 tube set above. With tubes and 5 inch speaker. Receives standard broadcast. Weight 10 lbs. Net \$9.95.

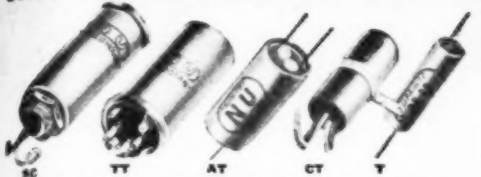
Chassis Model 825. A 9 tube transformer type AC chassis made for a superhet. Receives broadcast and FM. 88 to 108 MC. Size 11x8x8". 10 inch speaker. A ruggedly built receiver. Price includes tubes: 7B7, 7C7, 7C7, 7C7, 7Z4, 7N7, 1W7, 7A6. An ideal chassis to replace those old model chassis. Weight 30 lbs. Chassis, tubes and speaker, model 825, net \$34.95.

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National Union Type AT Electrolytics. Housed in sealed metal tubes in spun-end cardboard sleeves. Bare wire leads. Standard package of 10 condensers. Save over half. This is guarantee. One-year.

AT 10 MFD. 25 Volt 11/16x13 1/2	15c	AT 4 MFD. 450 Volt 13/16x13 1/2	20c
AT 25 MFD. 25 Volt 11/16x13 1/2	20c	AT 8 MFD. 450 Volt 13/16x13 1/2	30c
AT 50 MFD. 25 Volt 11/16x13 1/2	25c	AT 16 MFD. 450 Volt 13/16x13 1/2	35c
AT 100 MFD. 25 Volt 11/16x13 1/2	35c	AT 40 MFD. 450 Volt 13/16x13 1/2	40c
		AT 80 MFD. 450 Volt 13/16x13 1/2	45c

AT 5 MFD. 50 Volt 11/16x13 1/2	10c	AT 16 MFD. 150 Volt 11/16x13 1/2	15c
AT 10 MFD. 50 Volt 11/16x13 1/2	15c	AT 40 MFD. 150 Volt 11/16x13 1/2	25c
AT 25 MFD. 50 Volt 11/16x13 1/2	20c	AT 80 MFD. 150 Volt 11/16x13 1/2	30c
AT 50 MFD. 50 Volt 11/16x13 1/2	25c	AT 100 MFD. 150 Volt 11/16x13 1/2	35c
AT 100 MFD. 50 Volt 11/16x13 1/2	35c		

AT 8 MFD. 250 Volt 11/16x13 1/2	20c	AT 16 MFD. 250 Volt 11/16x13 1/2	25c
AT 20 MFD. 250 Volt 11/16x13 1/2	25c	AT 40 MFD. 250 Volt 11/16x13 1/2	30c
AT 24 MFD. 250 Volt 11/16x13 1/2	25c	AT 80 MFD. 250 Volt 11/16x13 1/2	35c
AT 40 MFD. 250 Volt 11/16x13 1/2	30c		

NATIONAL UNION ALUMINUM CAN "TWIST TAB" TYPE TT

National Union Type TT Electrolytic Condensers. Aluminum can F.P. type Twist Tab mounting common negative grounded to can. Individually cartoned in green N.U. boxes. Each condenser supplied with 1 bakelite insulating plate and 1 metal grounding plate.

TT 100 MFD. 25 Volt 1x2-1/16"	19c	TT 40-40 MFD. 150 Volt 1x2-9/16"	40c
TT 250 MFD. 25 Volt 1x2-1/16"	19c	TT 20-20 MFD. 150 Volt 1x2-9/16"	40c
TT 10 MFD. 450 Volt 1x2-1/16"	25c	TT 40-40 MFD. 150 Volt 1x2-9/16"	40c
TT 20 MFD. 450 Volt 1x2-1/16"	30c	TT 40-40 MFD. 150 Volt 1x2-9/16"	40c
TT 30 MFD. 450 Volt 1x2-1/16"	40c	TT 40-40 MFD. 150 Volt 1x2-9/16"	40c
TT 40 MFD. 450 Volt 1x2-1/16"	40c	TT 40-40 MFD. 150 Volt 1x2-9/16"	40c
TT 80 MFD. 450 Volt 1x2-1/16"	40c	TT 40-40 MFD. 150 Volt 1x2-9/16"	40c
TT 20-20 MFD. 150 Volt 1x2-1/16"	30c	TT 40-40 MFD. 150 Volt 1x2-9/16"	40c
TT 40-40 MFD. 150 Volt 1x2-1/16"	40c	TT 40-40 MFD. 150 Volt 1x2-9/16"	40c
TT 50-50 MFD. 150 Volt 1x2-1/16"	45c	TT 40-40 MFD. 150 Volt 1x2-9/16"	40c
TT 80-80 MFD. 150 Volt 1x2-1/16"	45c	TT 40-40 MFD. 150 Volt 1x2-9/16"	40c
TT 10-10 MFD. 450 Volt 1x2-1/16"	40c	TT 40-40 MFD. 150 Volt 1x2-9/16"	40c
TT 16-16 MFD. 450 Volt 1x2-1/16"	45c	TT 40-40 MFD. 150 Volt 1x2-9/16"	40c
TT 20-20 MFD. 450 Volt 1x2-1/16"	45c	TT 40-40 MFD. 150 Volt 1x2-9/16"	40c
TT 40-40 MFD. 450 Volt 1x2-1/16"	60c	TT 40-40 MFD. 150 Volt 1x2-9/16"	40c

TYPE "CT" ELECTROLYTICS DUAL TUBULAR BANKS

National Union Type CT Cardboard tubular electrolytic capacitors. Individually cartoned in green N.U. boxes. A red hot value at over 1/2 saving. One-year guarantee.

CT10-16 MFD. 150 Volt 1x2 23/32"	25c	CT16-16 MFD. 150 Volt 1x2 23/32"	25c
CT20-20 MFD. 150 Volt 1x2 23/32"	30c	CT30-30 MFD. 150 Volt 1x2 23/32"	35c
CT40-40 MFD. 150 Volt 1x2 23/32"	40c	CT50-50 MFD. 150 Volt 1x2 23/32"	45c
CT60-60 MFD. 150 Volt 1x2 23/32"	50c	CT80-80 MFD. 150 Volt 1x2 23/32"	60c

DUAL SECTION COMMON NEG.

AT 8-8 MFD. 150 Volt 13/16x13 1/2	20c	AT 16-16 MFD. 150 Volt 13/16x13 1/2	25c
AT 40-40 MFD. 150 Volt 13/16x13 1/2	35c	AT 80-80 MFD. 150 Volt 13/16x13 1/2	40c
AT 16-16 MFD. 150 Volt 13/16x13 1/2	25c	AT 40-40 MFD. 150 Volt 13/16x13 1/2	35c
AT 80-80 MFD. 150 Volt 13/16x13 1/2	40c	AT 16-16 MFD. 150 Volt 13/16x13 1/2	25c
AT 40-40 MFD. 150 Volt 13/16x13 1/2	35c	AT 80-80 MFD. 150 Volt 13/16x13 1/2	40c

N.U. THREAD MOUNT ALUMINUM CAN TYPE SC

National Union Type SC-SCN-SCS Upright Aluminum Can Condensers. With pat. out mounting. Flexible insulated leads. Individually cartoned in green N.U. boxes. Save over half on this. One-year guarantee.

SC 4 MFD. 450 Volt 13x31 1/2	25c	SC 8 MFD. 450 Volt 13x31 1/2	30c
SC 16 MFD. 450 Volt 13x31 1/2	35c	SC 40 MFD. 450 Volt 13x31 1/2	40c
SC 80 MFD. 450 Volt 13x31 1/2	45c	SC 160 MFD. 450 Volt 13x31 1/2	50c
SC 320 MFD. 450 Volt 13x31 1/2	55c	SC 640 MFD. 450 Volt 13x31 1/2	60c

SCN-DUAL COMMON NEG.

SCN 8-8 MFD. 450 Volt 13x31 1/2	50c	SCN 16-16 MFD. 450 Volt 13x31 1/2	55c
SCN 40-40 MFD. 450 Volt 13x31 1/2	60c	SCN 80-80 MFD. 450 Volt 13x31 1/2	65c
SCN 160-160 MFD. 450 Volt 13x31 1/2	70c	SCN 320-320 MFD. 450 Volt 13x31 1/2	75c

SCS-DUAL FOUR LEADS

SCS 8-8 MFD. 450 Volt 13x31 1/2	50c	SCS 16-16 MFD. 450 Volt 13x31 1/2	55c
SCS 40-40 MFD. 450 Volt 13x31 1/2	60c	SCS 80-80 MFD. 450 Volt 13x31 1/2	65c
SCS 160-160 MFD. 450 Volt 13x31 1/2	70c	SCS 320-320 MFD. 450 Volt 13x31 1/2	75c



100 N.U. SAV-A-SHAFT \$2995

National Union Sav-A-Shaft Volume Controls. A regular \$1.25 list item all individually cartoned with instructions. Every size control is equipped with an on-off switch which may be used by pulling small tab. These controls are handy as most of you radio service men know. For replacement merely saw off old Volume Control Shaft and drive into the National Union Sav-A-Shaft coupling. Pick the sizes you want at these dollar saving prices or just order one hundred, as we assort them for only \$29.95.

NU 5M-A 5,000 OHM	24c	NU 1 MEG-TX 1 MEG OHM Tapped	30c
NU 10M-B 10,000 OHM	24c	NU 2 MEG-TX 2 MEG OHM Tapped	30c
NU 25M-A 25,000 OHM	24c	NU 500M-CB 500 MEG	30c
NU 50M-B 50,000 OHM	24c	100 National Union Controls \$29.95	
NU 100M-B 100,000 OHM	24c	Assorted as follows: 25 of the 1st 3 Types,	
NU 250M-TX 250,000 OHM Tapped	29c	25 of the 2nd 3 Types, and 50 of the last	
NU 500M-TX 500,000 OHM Tapped	39c	4 Types.	

CRYSTAL CARTRIDGES

WE HAVE 'EM, \$1.39 AND UP EVERY XTAL GUARANTEED

3 Cartridges—95% Off Your Need \$1.79 Each, 10 for \$15.00

Astatic L-40 or equal, with rest clip, replaces the following: L-41, L-75, Webster C-5, E-F-9, N-8-5, or N-7. \$1.79 each; 10 for \$15.00.
Astatic L-70 or equal, with rest clip, replaces the following: L-71, L-76, or Shure P-88, P-89, W-40, W-50 or Webster, 1X6, 1X2, N-4, E-4, etc. \$1.79 each; 10 for \$15.00.
Astatic L-72 or equal, with rest clip, replaces the following: L-24, L-46, Shure P-89 and Webster, N10P5 a 3 Volt output that will drive single sale record players and put extra power in any player. The most universal crystal built. \$1.79 each; 10 for \$15.00.

CALTRON V.R. CARTRIDGE, \$2.95
Caltron Variable Reluctance Standard size cartridge as used in broadcast stations. Has permanent needle. A \$15.00 cartridge for only \$2.95.
GE Variable Reluctance Cartridge RPX-040 with replaceable needle \$5.85.
GE RPX-041 1 Mill Micro-Groove \$5.85.

CRESCENT DELUXE CHANGER ONLY \$14.95

Basic 400A Crescent Deluxe 78 RPM Automatic Changer with shure cartridge. Shuts off on last record. Base size 11x13 1/2". Deep maroon finish. Weight 11 lbs. Scoop price \$14.95.
Aero 78 RPM Automatic Changer with Q.T. Cartridge and permanent needle. Base size 12x13 1/2". Scoop price \$12.95.
Two for \$24.95
VH-800 78 RPM Automatic Changer. Base size 13x14 1/2". A w o n d e r f u l buy at \$12.95. Two for \$24.95
Farnsworth 78 RPM 2-Post Automatic Changer with reduced space. Space required 12x14 1/2". A Scoop at only \$10.95
Triple Post 78 RPM Seeburg Automatic Changer. Super construction. Intermixes 10" and 12" records. Base size 14x14 1/2". Scoop price \$12.95
General Instrument 78 RPM Automatic Changer. A fine small changer. Base size 10 1/2"x12". Net \$14.95
Leatherette made to fit but for any of the above changers \$1.95 each.

WEBSTER DUAL-SPEED

World famous Webster Chicago model 256 dual speed automatic record changer for 78 regular 78 RPM records and the new 33 1/3 micro-groove records. New pick-up with needles mounted in tandem for flip the wrist change. Base size 14x14 1/2". This is the famous tilt-o-matic model. Weight 18 lbs. Net \$31.53
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All latest production 600 volt tubulars Branded by their makers as type T.P. Buy 100 assorted for only \$6.95—8 cents each in smaller quantities. .04, .06, .02, .04, .06, .08.
1600 volt rated for the tough job or auto buffers. .02, .02, .04, .05, 15c each; 10 for \$1.29.

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Genuine Solar Screw Mounting Wet Electrolytics. Latest 1948 production. Use Solar wets when you want a filter for those tough jobs.
8 mfd. 500 Volt wet. Solar \$0.87
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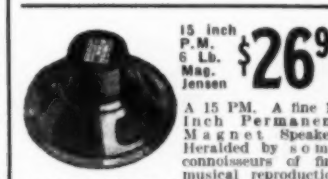
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Standard Auto replacement heavy duty regular size, \$1.29 each, 10 for \$11.95.

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Replacement sync vibrator unit	\$0.99
Standard 3 prong sync vibrator	1.49
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as the world's finest speaker. Brand new original cartons. 6 Pound Alnico 3 Magnet. 1 1/2 Inch 8 Ohm Voice Coil. One piece molded cone made by Jensen. A regular \$55.00 list price for only \$26.95. Two for \$50.00. Weight 22 lbs.

McGEE RADIO COMPANY

Order from This Ad—With Full Remittance Include Postage or May Be Sent Express Collect

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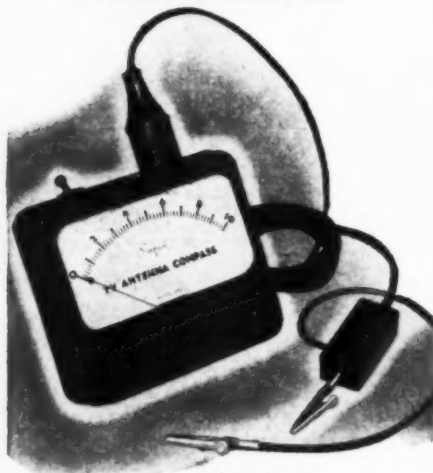
May, 1948

NOW...

ONE MAN ALONE



CAN ORIENT A TV ANTENNA QUICKER and BETTER!



with the New
SIMPSON
TV
Antenna Compass

Simpson Model 351 is a ruggedly built pocket size meter which connects to the video input of the cathode ray tube in a television receiver. By an extension cord it is carried to the antenna site. With a test pattern tuned in on the area's weakest station, the antenna is simply rotated for maximum deflection of the TV Antenna Compass! Identifies ghosts, too. Much more accurate than the old-fashioned method—and *one man does it in one-third the time two men used to take!* Dealer's net price only \$16.35. Your Parts Jobber has them NOW.

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CHICAGO 44, ILLINOIS

In Canada:

Bach-Simpson Ltd., London, Ontario

EYESTRAIN—A New Video Hazard

By **W. S. STEWART**
TV Ed., "International Photographer"

**TV manufacturers must help eliminate this very
real threat to television's entertainment role.**

A MOUNTING number of television fans are finding that their favorite entertainment medium is causing them considerable grief in the form of eyestrain.

One factor contributing to this situation is the viewing of television screens in totally darkened rooms. This practice puts a severe strain on even normal eyes. Many optometrists recently have pointed out that alternate shifting of the eyes between a relatively bright television screen and an adjacent area of total darkness places an abnormal load upon the light accommodating mechanism of the eye.

One of the foremost reasons for dark room television viewing is the poor judgment used in cabinet design by many of the television manufacturers.

Too many TV cabinets employ highly reflective materials to mask the television screen.

Materials such as highly polished wood and brass, chrome and plastic trim and excessively large areas of polished plate glass surrounding the picture area provide sources of intense specular reflections from even subdued room lights or window light.

Some television cabinet designs are so poor that distracting specular reflections from the picture tube light itself are bounced into the observers' eyes from the picture area masking material. The latter situation is especially bad when the picture frame has an inside bevel.

Thus, the predominating tendency of television set owners to view their TV in total darkness is encouraged by the fallacies of picture-masking techniques on the part of the television manufacturers.

It may not be true, but the evidence seems to point to a professional, obstinate, and incongruous jealousy between the radio-television and motion picture industries.

The motion picture industry and allied photographic and visual arts professions have spent upwards of fifty years in the study of picture viewing.

The gamut from pure scientific research to empirically derived formulas, painstakingly developed over an extended period, has determined

physiological and psychological medi-ans and standards of practice which are difficult to refute with respect to picture viewing.

These decades of study have indicated that a dark, matte surface surrounding pictures of the transmitted-light type provides the optimum viewing condition.

It is difficult to comprehend upon what premise the TV manufacturers, relatively inexperienced in the visual aspects of communication, proceed to decorate picture-area borders with shining gingerbread of brass, chrome, and glittering plastic.

Some specular reflection is unavoidable due to the smooth glass surfaces of the cathode-ray tube face and the shatter-proof protective glass plate covering the picture area.

Thus, since the necessary materials involved in the actual presentation of the picture to the viewer are inherently reflective it seems to be extremely poor practice to aggravate the dilemma by masking the picture area with additional highly reflective materials.

In view of the fact that many of the spurious reflections from ambient light sources can be eliminated by obvious cabinet design treatments, it seems that some effort should be made in the direction of excluding the built-in reflections from the polished surfaces of the cathode-ray tube face and its protective glass plate.

A variation on one of the coated-lens techniques, as applied to plane glass surfaces, might lead to a solution of the problem. Another solution might be found in some type of very light etching of the glass surfaces involved to reduce the unwanted reflections without intolerable loss of contrast range and definition.

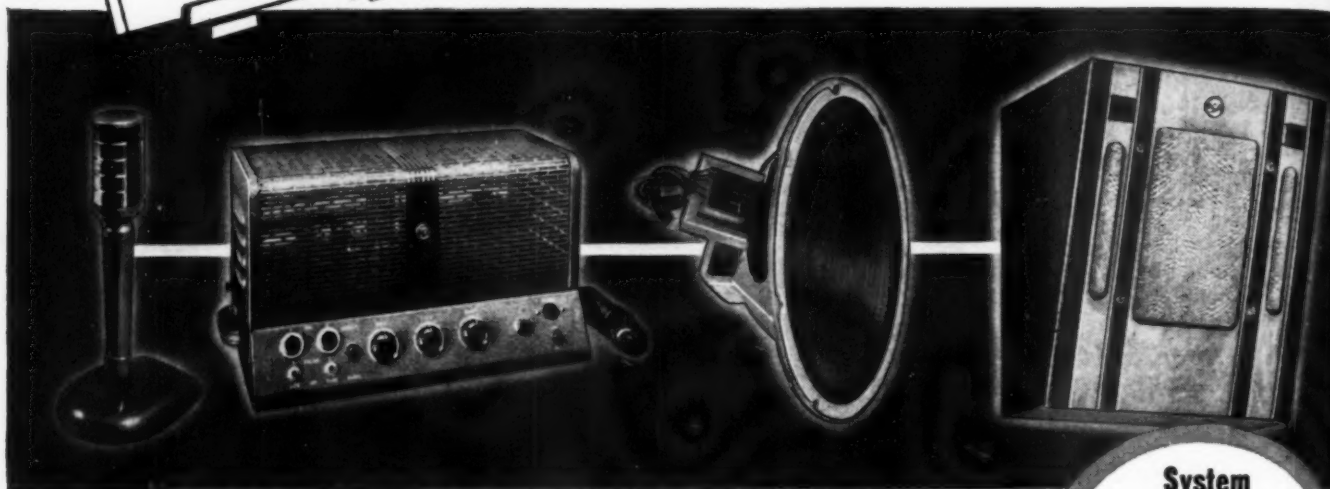
Many suitable materials, from both a decorative and utilitarian standpoint, could be given matte finishes to offer practically non-reflective surfaces for masking the picture area of the television receiver.

The gain in consumer viewing comfort would constitute a definite contribution to the television art and at the same time eliminate a point of sales resistance which may eventually assume major proportions.

RADIO & TELEVISION NEWS

Look at these
**SENSATIONAL
LOW PRICES**

Complete **MATCHED** High



RCA 25-WATT SYSTEM, UNEXCELLED VALUE

This complete, ready-to-operate, matched sound system surpasses any sound system you could buy at this sensational low price.

AMPLIFIER: High gain, wide range, low-distortion, 25-watt amplifier with inverse feedback. 2 high impedance microphone inputs—high and low impedance phono inputs—speech music switch and tone control—complete with tubes.

MICROPHONE: De luxe dynamic high im-

pedance microphone—modern, rugged, lightweight, with 15-ft. cable and matching base.

SPEAKER: 12-inch PM speaker with 6.8 ounce Alnico V magnet and multi-tap line matching transformer.

BAFFLE: Attractively styled, sloping front, walnut finish, wood baffle.

EXTRA SPEAKERS AND BAFFLES: Available at comparably low prices.

System
P-525-12W

\$99⁵⁰*

Suggested list price.

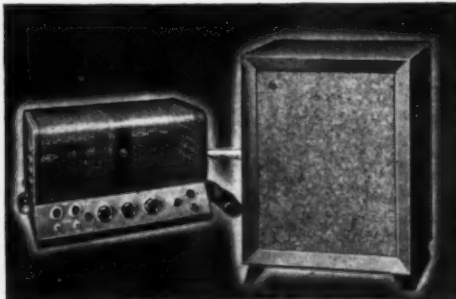
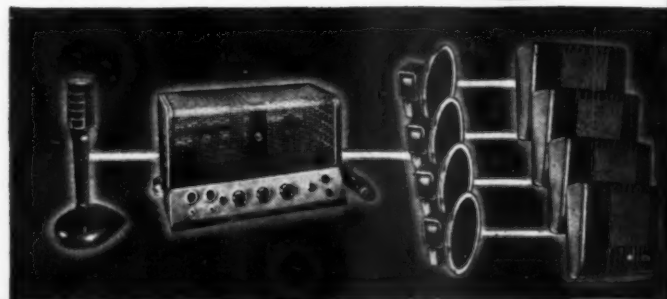
RCA HIGH QUALITY COMPLETE SOUND SYSTEM WITH 4 SPEAKERS

An ideal sound system for general applications—uses same 25-watt amplifier and microphone described in system P-525-12W—with 4 high efficiency 6-inch PM speakers with multi-tap

line matching transformers and beautiful molded fibre, sloping front baffles. Compare this unparalleled equipment value.

System P-525-6F4
\$119.50*

Suggested list price.



RCA DE LUXE MUSIC REPRODUCING SYSTEM

This system using the 25-watt amplifier described in System P-525-12W and a handsome modern console reproducer may be used with the sensational new RCA 45 rpm Record Player—or other turntable—or FM tuner to provide a superb music reproducing system. Console Cabinet is 22" wide, 25" high, 12"

deep available in blonde or walnut finish. The new RCA 45 rpm record player (pictured above) using the new 7-inch distortion free records is ideal for use with any of these sound systems.

System P-25-10C
\$139.50*
Suggested list price.
Less Record Player

All prices shown are suggested list prices subject to normal dealer discounts

*Prices do not apply outside the continental U.S.A.

Ask Your nearest
**RCA SOUND PRODUCTS
DISTRIBUTOR for
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84 pages of sound products—microphones, amplifiers, speakers, recorders, portable P.A. and other profitable items.

RADIO & TELEVISION NEWS, May,

Quality Sound Systems by RCA...

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 408 W. 4th Street, Santa Ana
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 1534 Cahuenga Blvd., Hollywood 28
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Fargo, North Dakota—To be announced
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Atomic Sound Engineering Co.
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Radio Laboratories
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**If you are interested in qualifying as a distributor or dealer,
 please write to RCA Victor Division, Sound Products Group, Camden, N. J.**



SOUND PRODUCTS

RADIO CORPORATION of AMERICA

ENGINEERING PRODUCTS DEPARTMENT, CAMDEN, N. J.

In Canada: RCA VICTOR Company Limited, Montreal

What's New in Radio

AUTOMATIC RESONATOR

Lewis E. Babcock & Co., 62 Basswood Ave., Providence 8, Rhode Island, has announced a small, inexpensive automatic resonating device, designed



to tune to resonance in succession, any desired number of grid and plate tank circuits. The unit will resonate the antenna tuning circuit, the final plate tank, and all the tuned circuits back to the first exciter stage plate tank in any transmitter.

The device can be incorporated in a transmitter by merely adding the motors, and running the connections from it to the resonator unit. The system is non-critical as to operating frequency and uses no special tuned circuits of its own, no selsyns, and imposes no limitations on the efficiency of the equipment with which it is employed.

Further information can be obtained by writing Lewis E. Babcock & Co., at the Rhode Island address.

INSULATED CHOKES

Especially engineered for television and FM receiver requirements, the new line of fully insulated chokes announced by *International Resistance Company* are said to be relatively inexpensive. The firm believes the additional savings over so-called more conventional types are made possible because of the molded phenolic housing, which not only provides complete protection against high humidity, but



reduces assembly loss by affording protection from abrasion and physical damage.

These new chokes come in two sizes, Types CLA and CL-1. There is a wide range of size and characteristic combinations available. Resistance is low enough to enable their use as filament

chokes for moderately high-power tubes.

Samples for testing as well as comprehensive catalogue data may be obtained by writing *International Resistance Company*, 491 N. Broad Street, Philadelphia 8, Penn.

ASTATIC CRYSTAL CARTRIDGE

The LQD crystal cartridge produced by the *Astatic Corporation*, Conneaut, Ohio, uses two separate, independent needles, one with one-mil tip radius to play the new long-playing records, the other with three-mil tip radius for standard recordings.

These double-needle, turnover type pickup cartridges use the Astatic "Q" and "Q-33" needles available for some time. A gentle pry with a penknife or small screwdriver lifts either of these special needles from its snap-in position in the cartridge, without removing the cartridge from the tone arm. Gentle pressure with the tip of a knife blade clicks the new needle into place. Removing or replacing one needle does not disturb the other.

Top reproduction quality also is claimed for the LQD, with excellent frequency response, particularly at low frequencies. A relatively high



vertical and lateral compliance of the Q needle design is said to provide appreciable reduction in needle talk.

The LQD cartridge has a stamped aluminum housing. The output voltages are 1.2 at 1000 cycles with 78 r.p.m. audio-tone test record; .75 with 33 1/3 r.p.m. Columbia 281 test record; and .5 with 33 1/3 r.p.m. Columbia 103 test record. Recommended needle pressures are 15 grams for 78 r.p.m. and six to eight grams 33 1/3 r.p.m.

Write to *Astatic Corporation*, at Conneaut, Ohio, for more complete information.

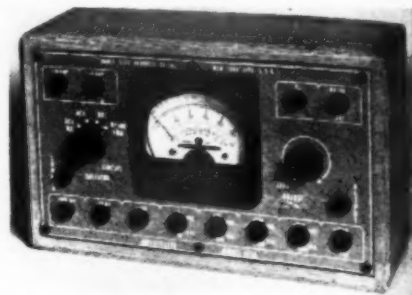
STREAMLINED MULTITESTER

A new, streamlined version of the Model 447 manufactured by *Radio City Products Co.*, 152 W. 25th St., New York, N. Y., has been announced, with no increase in price scheduled for the improved unit.

This Model 447A Multitester is lighter in weight because of a magnesium panel and a new battery arrangement. The panel is attractively

finished in hammertone grey with white markings to correspond to the other instruments in the line. The ohmmeter circuit has been simplified so as to have the same over-all coverage with only one unit cell and an improved battery holder.

Provision is made for extending the ohmmeter range to 10 megohms by using an external battery, and a gold-plated copper oxide rectifier with ex-



cellent current density characteristics gives improved performance for the measurement of a.c. and output voltages.

NEW MINIATURE CABINET LINE

Recent additions to the regular line of *Bud* sheet metal products include cabinets, boxes, amplifier foundations, and aluminum chassis for equipment using miniature tubes.

Bud Radio, Inc., now offers over 200 different sheet metal housings fabricated from steel and aluminum for radio and electronic equipment. Most of these are available for immediate delivery.

Estimates and manufacturing details are furnished upon receipt of engineering drawings. For complete information write to *Bud Radio, Inc.*, 2118 East 55th Street, Cleveland, Ohio.

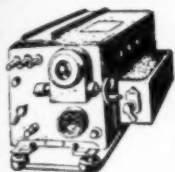
"THE MEGALIGNER"

A marking device which covers the frequency range of 19 to 49 mc., including all present and proposed i.f. bands, has been introduced by the *Kay Electric Company*, Pine Brook, N. J.

This new instrument, designated "The Megaligner," has a self-con-



tained power supply and provides a tunable c.w. signal which may be used as a signal source or with "The Mega-



GREAT BUY!

RU-16 receiver with 3 plug-in coil drawers. Great for hi-fi tuner, monitoring, etc. 3 stages TRF. BFO. Used. Price with tubes, plug and simple conv. diag. **\$5.95 ea.** Brand new receiver with 5 plug-in coil drawers, shock mt. base, plug and conv. diag. **\$16.95.**

RU-16-17 Receiver Control Box with plug. NEW. **\$2.50 ea.** Power Supply Kit for above Receiver. All parts and diag. included. **\$9.45.**
RU-16-17 Tube Kit. 2—77's, 3—78's, 1—1642 tubes. ORIG. CARTONS. ONLY **\$2.85 ea.**

LIMITED QUANTITY ITEMS

BC-342 Receiver. Used, but in good cond. Tested before shipping. **\$79.50 ea.**

ARM-5A 11 tube Glide Path Superhet. NEW. 332 to 335 mc. Complete with tubes. Sealed cartons. Tubes alone worth the price of only **\$10.95 ea.**

Telescopic Whip Antennas. BRAND NEW. Extends to 7' in nine sections. Complete with mtg. base. Sealed Cartons. Price **\$1.75 ea.**

Push Button Tuning Unit. A Mechanical tuning mechanism which is adaptable to any tuner. 10 Chrome Plated Push Buttons operate tuning condenser. A Real Buy at **\$1.95 ea.**

Desk type Telephone Mike. Mfgd. by Strom. Carlson and Kellogg. With p. to t. sw. ONLY **\$2.95.**

COMBINATION OFFER. This month only. 70 ma. Power Xfmr., 70 ma. Choke, Dual Smfd. 450v. Filter, 5Y3GT tube and socket. 275v. @ 70ma., 6.3v. @ 3a. output. All items NEW. Only **\$4.95** for lot.

SCOOP! Here's a BUY. 10" P.M. Speaker with good sized Alnico 5 magnet. Large 1" voice coil. Sturdy construction throughout. Handles 10 watts. Reg. Price **\$11.50.** Your cost **\$4.60 ea.**

WHIP ANTENNA. 4 Sect. Chromed brass. Extends to 23 3/4". For UHF Ant., Beams, etc. 8-32 mtg. ONLY **90c ea.**

CONDENSER TESTER

One of our best sellers! Useful, versatile laboratory item, in kit form. Simple, and easy to build in less than an hour. Checks condenser leakage and continuity up to 8-megs. Will test any paper, electrolytic, mica or oil condenser from 50-uuf. to 50-mfd. Self-contained power supply and neon bulb indicator with socket and bezel. Drilled Metal Cabinet. Complete instructions and diagrams included with each kit. ONLY **\$4.85.**



REAL BARGAIN!

HS-16 Headphones with standard long cord (6 ft.) and adjustable headband. Unquestionably the best buy in surplus phones ever sold. Tested before shipping. Limited quantity. **\$1.35 ea.** POSTPAID in U.S.A. and Canada.



POWER SUPPLY FOR ANY 274-N RECEIVER

Here it is—at last! Just plug it into the rear of your 274-N RECEIVER... any model! Complete kit, and black metal case, with ALL parts and diagrams. Simple and easy to build in a jiffy. Delivers 24 volts plus B voltage. No wiring changes to be made. Designed especially for the 274-N receiver. All necessary parts for conversion of rest of receiver also included. ONLY **\$7.95.** TUNING KNOB for 274-N Receiver, **59c ea.**



SIGMA HERMETICALLY SEALED 7000 OHM SPDT RELAYS!

Operates on 1 ma. current change. This relay requires no maintenance as all moving parts and contacts are in a VACUUM! Contact ratings, 1 amp. Used in photoelectric equipment, remote control, receivers, etc. Heavy wire lead connections. Spade bolt mtg. Govt. cost many times our low price of only **\$1.95 ea.** 10 for **\$17.00.**



KURMAN #1901 SPDT SENSITIVE RELAY

1700 ohm fast acting coil closes on 2 ma. 2 amp. 5/32" silv. cont. Mtd. on thick Mycalex base 2 3/4" x 3/4". BRAND NEW. **\$1.50 ea.** or 10 for **\$12.50.**

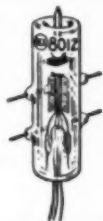


BC-221 Frequency Meter. Range 125KC to 20,000 KC. We have been fortunate to purchase another small lot of BC-221 Frequency Meters. In keeping with our policy of good merchandise, these units are all in excellent operating condition and each unit is checked before shipment. Perfect condition inside. Only minor scratches on outside of cases prohibit us from calling these units brand new. Get yours NOW as we know these will not last long! Complete with tubes, original calibration chart and crystal **\$5.95 ea.**

BC-221 Power Supply Kit. Includes chassis, transformer, rectifier, all parts and diagram **\$5.85 ea.**
BC-221 Modulation Kit. Converts any BC-221 for modulation. All parts and diagram included. ONLY **\$3.90**
BC-221 Set Spare Tubes. ONLY **\$1.29.**

VHF SURPLUS TUBES

FILAMENTS TESTED BEFORE SHIPMENT! ALL BRAND NEW!



RCA 8012 VHF Triode. TANTALUM plate and Tantalum grid! 35 watts output. 40 watts Plate Dissipation. Used as osc. or amp. at full ratings up to 500 MEG! C.T. 6.3v. Filament reduces filament lead inductance. All Brand NEW! Reg. price, **\$14.50.** A large quantity purchase allows us to reduce the price of this tube to only **\$5.00.**

\$1.50 ea. or 4 for **\$5.00.**
826 UHF Triode. Full ratings (86 watts output) up to 250 mc! Get real power on 2 meters with a pair of these tubes. BRAND NEW! Get yours NOW **75c ea.** or 4 for **\$2.40.**



WE717A PENTODE. Hams know this tube's ability to "soup up" any receiver. Has transconductance of 4,000 and is interchangeable with 6SK7. Low loss base and ultra-short leads. Functions better at high frequencies. ALL BRAND NEW! Orig. cost **\$3.75 ea.** Your price **98c ea.** or 4 for **\$3.25.**

829 Twin Beam Tetrode. Ideal for UHF. Brand new in orig. cartons. **\$2.80 ea.** or 4 for **\$10.80.**

829B Twin Beam Tetrode. This well known tube is ideal for application at VHF. Full output (87 watts) up to 200 MEG! BRAND NEW! **\$3.95 ea.** or 4 for **\$13.50.**

832 Twin Beam Tetrode. NEW. **\$2.50 ea.** or 4 for **\$9.80.**

832A Twin Beam Tetrode. 26 watts output up to 200 MEG! BRAND NEW! ONLY **\$3.95 ea.**

807 Beam Tetrode. One of the most popular tubes for r.f. application. Brand new, **\$1.12 ea.** or 4 for **\$3.95.**

810 Power Triode. This tube is a real powerhouse! 575 watts output up to 30 mc! Carbon anode. Grid outside of envelope for max. h.f. efficiency. BRAND NEW! Only **\$5.95 ea.** or 4 for **\$21.95.**

815 Twin Beam Tetrode. Full ratings (56 watts output) up to 125 mc! Requires only .18 watt grid driving power for full output. Brand new. Only **\$2.50 ea.** or 4 for **\$9.20.**

836 H.V. Rectifier tube. Similar characteristics to 866. Interchangeable. Don't miss this BUY! 2 for **\$1.10.**

872 Rectifiers. New. **\$1.75 ea.** or 2 for **\$3.25.**

5U4G and 5Z3 tubes. New. **39c ea.**

6AB7, 6AC7 tubes. New. **79c ea.**

6L6G Nat'l Adv. Brand. NEW. Don't miss these at **79c ea.** or 4 for **\$3.00.**

CK-1005 Rectifier. Cut off pin #6 and you have an OZ4. Several different experimental circuits inc. with each order. Price **3 for \$1.00** Postpaid.

NEED 866 TUBES?



Then you'll be interested in our large shipment of NEW 866 tubes, just received. Same base connections and very similar ratings to 866. Hi-vacuum eliminate hash trouble. Navy used them extensively in various equip. because of this reason. Internal voltage drop similar to 866. Characteristics: Fil. 2.5v. @ 3a. Plate curr. 500ma. (av.) for 2 tubes. Inv. Peak v. per tube, 5,000v. OUR PRICE IS THE SCOOP OF THE YEAR! 2 for **\$1.10.** Be sure to get yours while quantity lasts.

5-VOLT, 60-AMP. XFMR.

110v. 60 cyc. pri. Ideal for 304TL, VT-127A, etc. NEW. Mfgd. by Kenyon. Limited quant. **\$5.95.**

2 1/2-VOLT, 10-AMP. XFMR

110v. 60 cyc. pri. 13,000 v. ins. For 836 and 866 rectifiers. NEW. Mfgd. by Kenyon. BUY. **\$4.95 ea.**

COLLINS MODULATION XFMR

Handles 2,000 watts audio power. BRAND NEW. Pri. impd. 12,000 ohms. Sec. 4,000 ohms. Freq. resp. ± 1 db. to 5,000 c.p.s. Sec. carries dc of mod. amp. 10 1/2 x 13 1/2 x 11 1/2". Wt. 166 lbs. boxed. Orig. boxes. **\$59.50 ea.**

COAX FITTINGS

UG/21U Straight plug. **25c ea.**
CQA 49470 Chassis recept. for UG/21U. **25c ea.**
UG/29U Straight Union. Fits UG/21U. **15c ea.**
UG/27U Rt. angle adaptor plug. **30c ea.**
 British type snap-on coax. plug and socket combination 10H/701 plug and 10H/528 recept. Set **25c ea.**
63-1 SPN/PL-259A Std. Coax. Cable plug. **49c ea.**
63-1R/50-239 Chassis recept. for above **79c ea.**

RM-53 REMOTE CONTROL BOX

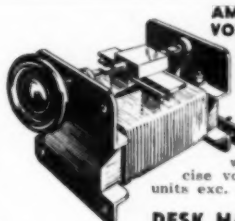
Two way telephone conversation can be routed over a transmitter and receiver output transferred to a telephone line with this handy remote control box. ONLY **\$2.50 ea.**



R-1/ARR-1 Homing Receiver

Read excellent article in Jan. RADIO NEWS how to convert this receiver to high freq. converter to use with your present receiver. Beautifully built, compact, easy to convert. Like new cond. with 4 acorn tubes and plug. ONLY **\$9.95 ea.**

AMERTRAN TRANSTAT VOLTAGE REGULATOR



Here's a real value! Spiral screw type brush adjustment with handwheel. Extremely heavy brushes. 2.17 max. amps. Voltage range 103-126 volts. 115v. 60 cycle fixed winding. Useful for precise voltage adjustments. All units exc. cond. ONLY **\$4.95 ea.**

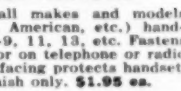
DESK HANDSET HANGER

Designed to fit all type handsets equipped with butterfly switch such as TS-9, 11, 13, etc. Circuit opening switch operates when handset is returned into place. Switch contact ratings 5a. 110v. Handsomely finished in Black Crackle. ONLY **\$5.95 ea.** Limited Quant.



HANDSET HANGER

Accommodates all makes and models (W. E. Kellogg, American, etc.) handsets such as TS-9, 11, 13, etc. Fastens to side of desk or on telephone or radio equipment. Felt facing protects handset. Black crackle finish only. **\$1.95 ea.**



TS-10 SOUND

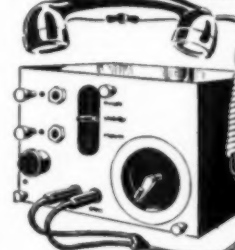
POWERED HANDSETS

These are what you have been waiting for! All BRAND NEW. Made by WE, RCA and Automatic Elect. Requires no batteries or transformers. Of course! Useful for TV antenna installations, inter-comms, line communication, etc. "No battery" feature makes it possible to provide communications in plants where explosive chemicals are used. Clip a TS-10 on each end of a line and you have communication in a jiffy. Air-mail or wire your orders now as quantity is limited. Price **\$16.50** per pair. Replacement WE Receiver Units for TS-10 Handsets ONLY **\$4.95 ea.**



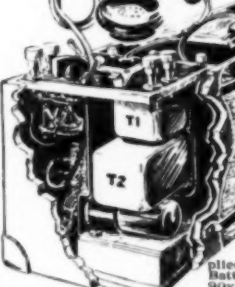
RM-29A TELEPHONE

These famous telephones now available in limited quantity. Contains magneto ringer system for calling. Uses standard batteries available anywhere. Only two wire line needed to connect. Units may be paralleled on same line. Lines up to several miles can be used. Ideal for Communication. Orientation of TV Antennas, Farms, Factories, etc. One RM-29A Telephone with battery and one TS-13 Handset, all BRAND NEW. PRICE **\$12.95 ea.**



EE-89A TELEPHONE REPEATER

Here's a REAL BUY. Improves transmission and extends talking range of EE-8 and RM-29A telephones. Only 2 wire lines used. Simplex telegraph and 20 cycle ringing possible over lines equipped with one or more of these repeaters. Hybrid coil allows transmission in both directions. Supplied with low-drain 3Q5 tube. Batteries used: 1 1/2v. and 90v. Featherweight phone supplied. simplifies gain setting. BRAND NEW. Complete with instruction manual. Limited quantity.



ONLY **\$9.95 ea.** Limited quantity.



Brand new ELECTRIC PAINT SPRAYER

Just plug it into any 110v. AC outlet and spray! No compressor or other bulky equipment needed. This improved model has modified bakelite head with trigger-control and nozzle adj. Sprays lacquer, enamel, varnish, disinfectants, insecticides, light oils, etc. Perfect for all radio and household uses. Ordinary Mason Jars can be used. Burgess Vibro-sprayer with instructions, extra nozzles and jar. ONLY **\$12.95** POSTPAID in U.S.A. and Canada.

★ 4-HOUR MAIL-ORDER SERVICE. WE SHIP ANYWHERE. 20% DEPOSIT MUST ACCOMPANY ALL ORDERS. BALANCE C.O.D.

OFFENBACH & REIMUS CO.

372 ELLIS ST. SAN FRANCISCO, CALIF.

PHONE—ORDway 3-8551

On the Warpath against capacitor troubles...

The SANGAMO
Pathfinder



TYPE 30
Molded Tubular

This molded capacitor is used extensively by television manufacturers. They find it easier to tie into their production lines because the especially designed, flexible leads are trouble-free... they resist breakage and they can't pull out! There is no wax to run when heat is applied. The thermo-setting plastic case is molded with less heat...less pressure...the element is not distorted in fabrication. This means greater dependability—no "hot spots." Try this stable, rugged, long-lived paper-tubular—you'll like it!

The SANGAMO
Chieftain



TYPE MT
Dry Electrolytic

The Chieftain is tiny, but durable! Meticulous care in manufacture protects against source contamination and assures corrosion-free elements. These capacitors have heavy insulating sleeves that are wax impregnated—not dipped. Positive electrodes are formed of rugged, etched-foil aluminum plate which insures longer life, greater dependability.

Small in size, with bare copper leads, the Chieftain is easy to mount—ideal for replacements—anywhere! Bulletin 825 gives complete information.

See your Jobber—if he can't supply you, write us direct.

Your Assurance of



The SANGAMO Tribe
PAPER-MICA-SILVER-ELECTROLYTIC CAPACITORS

Dependable Performance

SANGAMO ELECTRIC COMPANY
SPRINGFIELD, ILLINOIS
IN CANADA: SANGAMO COMPANY LIMITED, LEASIDE, ONTARIO

50th ANNIVERSARY
SANGAMO
1899-1949

AMSCO'S MAY SPECIALS

67 LEFT PHOTO-CELL AMPLIFIER



110V, 60 cy. Drawer type. Has milliammeter on front panel. Complete with tubes—6V6, 6J7, 45, 80 and VR105.

\$9.95

PARABOLIC REFLECTORS

15" spun aluminum. Alzak fin. for 1200 Mc. Up. Per pair **\$3.00**

Available **1121-1123** Write Today

AMERICAN SALES CO.
1811 W. 47th St. Chicago 9, Ill.

GET YOUR COPY NOW!



LOUD-SPEAKERS

THE WHY & HOW OF GOOD REPRODUCTION

by G. A. Briggs

Send Only **\$1.50** Postpaid

LOUD-SPEAKERS

by G. A. Briggs

Here's the WHY and HOW of good reproduction explained in simple, non-technical language. Saves money, avoids pitfalls for layman and enthusiast. A remarkable book highly praised by authorities.

British Industries Corp., Dept. H
315 Broadway, New York 7, N. Y.

Sweep" to produce a tunable "birdie" type marker on an oscilloscope display. In addition, when used with "The Mega-Sweep," a tunable "pip" type marker may be connected directly to the vertical amplifier of the display oscilloscope, if desired, which does not overload the receiver or disappear in traps.

The two markers have independent amplitude controls, and the accuracy of the instrument is 5 per-cent of full scale. "The Megaligner" is priced at \$150.00, F.O.B. Factory.

MOBILE DX CONVERTER

The Gonset Company recently announced that it has in production a compact short-wave converter to permit reception on an ordinary auto radio.

The converter derives power from the set and uses the regular auto



antenna; normal or short-wave reception can be obtained if desired. By means of a bandswitch, it covers all frequencies between 3 and 30 megacycles, and short-wave signals can be brought in from all over the world with good volume. The work of connecting the converter is simple and takes but a few minutes.

Further details on this Model 3-30 may be obtained by writing to the Gonset Company, 72 E. Tujunga Ave., Burbank, Calif.

FIXED-FREQUENCY TUNERS

Of the three fixed-frequency FM tuners recently announced by *Browning Laboratories, Inc.*, Winchester, Mass., Model RP-25 combines most of the features of the others and, besides, permits turning the audio "on" or "off" as required.

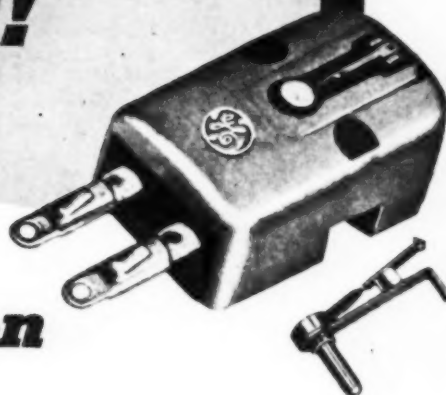
In common with the *Browning* Model RP-23, it is crystal controlled and



adapted to relay reception, storecasting installations, or monitoring purposes. As in the Model RP-24, it also contains relay circuits that operate on tones of from 15 to 20 kilocycles received from the transmitter and which select in sequence two preset audio volume levels that may be man-



**has a
new meaning
now!**



Stylus Replacement Often

WHEN the big attraction hit town they hung the "Standing Room Only" sign—it meant overflow business.

It still means that, but the big attraction now drawing overflow business for distributors and dealers is the G-E Variable Reluctance Cartridge with the Replaceable Stylus.

Why? Because record fans who know their records best wanted the finest reproduction possible. The G-E Variable Reluctance Cartridge gave them just that. To secure peak performance they often replaced the cartridge when the stylus was only slightly worn.

Now, with the Replaceable Stylus, cartridge replacement is no longer necessary. In four easy steps the cartridge can be removed from the tone arm, the stylus changed and listening pleasure increased.

Economy is the big feature but this redesigned cartridge has many other advantages. Smaller in size, it can be adapted to many

more tone arms. Higher lateral compliance provides more faithful tracking, hence better fidelity. Frequent stylus replacement reduces record wear and adds hours of top listening pleasure. Needle talk and needle scratch are negligible, giving cleaner, finer reproduction.

Best of all, the cartridge is available for either the new LP records with 1 mil stylus or for conventional records with the 3 mil stylus.

Now for the *Big Extra* to step up sales! A neat dispensing unit for the counter with two cartridges and six styli recessed in a gold-flocked panel to catch the eye. The entire unit is finished in an attractive blue and has a compartment in the rear for additional stock. It is a silent salesman that keeps selling. See your distributor right away for details.

For complete information on Variable Reluctance Cartridges and Replaceable Styli write to: General Electric Company, Electronics Park, Syracuse, New York.



The counter sized dispensing unit for greater sales—7½" long, 5½" wide, 4¾" high at the back.

You can put your confidence in—

GENERAL  ELECTRIC

SPRAGUE PHENOLIC-MOLDED TELECAP* TUBULARS



**THE MOST
TRULY
DEPENDABLE
PAPER
TUBULAR
CAPACITORS
EVER OFFERED
TO THE
SERVICE
PROFESSION**

- Extra Dependability at No Extra Cost
- Withstand Heat and Humidity, Shock and Vibration
- High Insulation Resistance
- High Dielectric Strength
- Unequalled for Sizzling AC-DC Midgets, or "Hot" TV and Auto Sets.

See Your Jobber Today!

SPRAGUE PRODUCTS CO.

North Adams, Mass.

Trademark

ually adjusted from zero to full output.

Model RP-25's two relay operations are controlled by transmitted tones of different frequency and are, therefore, independent. As in the RP-24, the relay circuits are preset to operate at 15, 17½, or 20 kilocycles, as specified by the customer.

All of the models are rack panel style, finished in black leatherette, and can be supplied with steel cabinet if desired.

For further information, address the company at 742-750 Main Street, Winchester, Mass.

NEW TELEVISION CAPACITORS

Distributors of the *Sprague Products Company*, North Adams, Mass., have been supplied with complete lines of the company's television replacement electrolytic capacitors, engineered especially for the tougher applications.

These new type TVA and TVL "Twistlock" electrolytics are designed to stand up under the extremely high temperatures, high ripple currents, and high surge voltages encountered in television receivers.

Complete descriptions of these capacitors is given in the *Sprague* bulletin M-429, available upon a postcard request, and the listing includes 93 separate ratings comprising the units most needed by teleservicemen. Address inquiries to *Sprague Products Company*, North Adams, Mass.

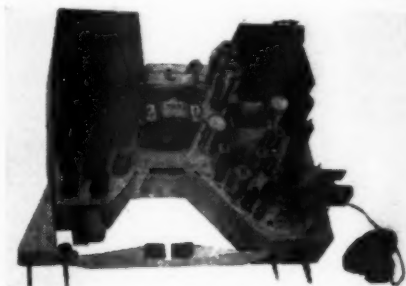
PRE-ALIGNED KIT

Believing that pre-alignment of the vital channels is the only satisfactory method of kit assembly, the *Philmore Manufacturing Company, Inc.*, has designed its TV kit with tuner, video, and sound channels completely wired and fully aligned.

Among the features *Philmore* has provided are complete 12-channel tun-

ing, daylight viewing, built-in extra power for video up to 16 inches, PM speaker with choke, and the mounting of all components to the chassis. A licensee of *RCA*, the company reports also that the kit circuit is very similar to the well-known *RCA* 630TS and 830TS.

Also available are the *Philmore* custombuilt television receivers, supplied



without cabinets, completely wired and assembled ready to play. These can be installed in any piece of furniture, and the customer has a choice of any picture size from 10 to 16 inches.

For further details, write the *Philmore Manufacturing Company, Inc.*, 113 University Place, New York 3, N. Y.

DIRECT-VIEW TV KITS

From now on, the direct-view television receivers made by the *Television Assembly Co.*, 540 Bushwick Ave., Brooklyn, N. Y., will be delivered with all of the major components mounted.

These changes were announced the first part of April by the *Snaider Television Corporation*, which operates *Television Assembly Co.*, as well as *Television Industries Co.*, as subsidiaries.

This innovation by *Television Assembly Co.*, which makes television kits for direct-view tubes from 10" up

BLUEGRASS BUYS

from

RADIO EQUIPMENT COMPANY

Dept. LD, 480 SKAIN AVE., LEXINGTON, KENTUCKY

Standard type variable condensers, size 1¼ x 1½ x 1¾, ½" shaft. Lots of uses. 120 mmfd—19c . . . 140 mmfd—24c . . . 170 mmfd—34c. One of each value 69c. Buy several for your parts box!

24V Transformers—Tapped at 4V. Primary 110V-60 cy. Rated 4 amp. Just the thing for operating your surplus equipment and a real low price. **Only \$2.49.**

Some real bargains in slightly used Genuine Stancor transformers, etc. Used for Army School demonstration and training but clean and good as new. Order before our stock is exhausted and save. Look at the list price—then at our price.

Stancor A-3808 Modulation Transformer. Primary 3,800/3,300 C.T. Sec. 10,000/7,500/5,000/4,500. List \$13.25.

Our Price Is \$2.95

Stancor C-1721 Choke. 8.5 Hy at 200 Mil. 3000 V. Ins. List \$6.30.

Our Price Is \$1.69

Stancor A-4404 Driver. P.P. Plates 3,000 to 5,000 to P.P. Grid. List \$7.30.

Our Price Is \$1.89

Stancor P-1325 Power Transformer. Pri. 115V-60Cy. Sec. 700V 100 Mil. C.T., 2.5V-4 amp. C.T., 5V-3 Amp., 6.3V-4 Amp. C.T. List \$8.00.

Our Price Is \$2.69

**SAVE
and Be
SAFE!**

**Buy Surplus & Standard Equipment
with money-back guarantee at**

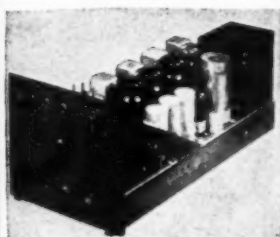
**R & M
RADIO**

EXTRA TUNING UNITS

\$2.50 each, FOB, Kingman, Ariz., or Arlington, Va.

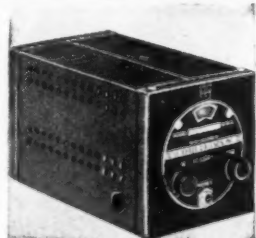
Types in stock: TU 5-7-8-9-10-26.

Typical components: 2 vernier dials; 1 var. cap., 20-135 mmf.; 1 var. cap., 20-156 mmf.; 1 var. cap., 8-26 mmf.—neutralizing; 1 .00003-2000V cap., CD—Mica; 3 .00009-3000V cap., CD—Mica; 2 .0004-6000V cap., CD—Mica; 3 .0001-3000V cap., CD—Mica; 2 4-position ceramic band switches; 2 RF chokes; 1 tank coil—ceramic form with tapped ant. coupling coil; 1 tank coil—ceramic form; 1 parasitic suppressor; 2 ceramic flex. couplings; plus banana jacks, stand-off insulators.



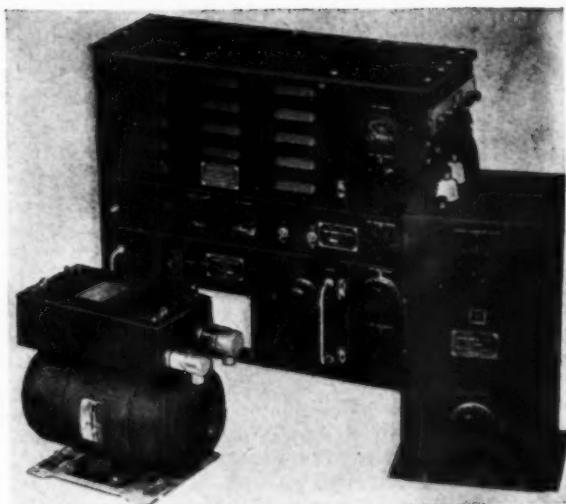
APN-4 RCVR—'SCOPE POWER SUPPLY

4 switch-selected screw-driver tuned RF channels; 1F freq. 1050 kc, band-width 45-60 kc; RF freq. 16 2000 kc. Tubes: (2) 2Y2, (3) 6B4, (4) 6SK7, (1) ea. 6SU4, 6SU7, 6SA7, 6H6, VR150. Makes fixed tuner for med. freq. police calls or PA system. Has power supply for 5" scope, with 400 cycle trans. Electronic-controlled low v. supply; delivers 260 vdc. 150 ma. reg. to .01%. Power supply alone worth \$8.95 more than price.



BC 1206, LAZY Q FIVER SINGLE SIGNAL RECEPTION \$9.95

The littlest BIG BUY ever offered! A BC-1206 Satchell Carlson receiver will take the place of BC-453 (Lazy Q Fiver). We think it's even better. Here's why: Smaller—4" x 4" x 6"; weighs only 3 lb. 14 oz. Less current drain, .75 amps at 24 v. DC. IF freq. 135 kc. A conventional superhet circuit is employed and is arranged so that AVC will prevent overloading on strong signals.



Buy it for conversion! Buy it to cannibalize!
Buy it to get on the air! It's the war-proved, versatile

- Complete with**
- tuning unit (TU-6)
 - antenna loading unit
 - dynamotor
 - set of plugs
 - all tubes
 - wiring diagram and conversion data free

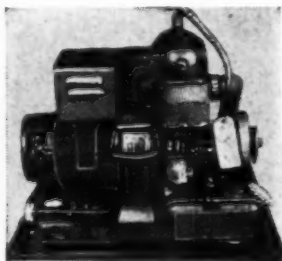
BC-375-E

Quantity Limited

19.95

FOB KINGMAN, ARIZ.

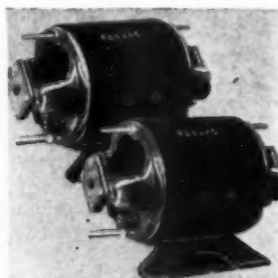
Complete conversion diagram included. Xmtr. designed to operate from 200 kc to 12 mc (less BC band). Equipped with antenna tuning unit BC-306-A—variometer and tap switch. Dynamotor (PE-73-C) complete with relay, fuses and filter.



The Famous PUTT-PUTT Gasoline Generator (NRU-28)

28-32
Volts D.C. \$74.50
ONLY

Single cylinder, 2-cycle gasoline engine with generator that is rated at 2,000 watts direct current, 70 amps. Has unlimited use around a farm; useful as field day power supply. More literature upon request.



DUAL POWER SUPPLY

SAVE YOUR
BATTERY \$4.95
Both for \$8.95 each

Use our dual dynamotors by wiring them in series and use one on receivers and both in transmitter. High voltage output 600 volts at 48 watts. Low voltage 300 volts at 24 watts.

**INTER-
COM**

**Factory
Close-Out!**

**Brand New and Priced
for Quick Clearance!**

Limited
Quantity

\$14.95

(List price \$34.95)

Price includes master station, one remote, and 50' of wire. Rig it up as a "baby-sitter" with pick-up at baby's crib. Useful in office, or for instant contact with basement, garage, attic, kitchen. Simple to install—just plug it in to 110 v. AC or DC socket.

TRANSFORMERS

For converting SCR-274-N to 115
Volts AC.

No. 1 Power Transformer. Pri—115v 60 cycle; sec—500 CT .06 Amp. 24v .1/4 amp.

Price only \$3.90

No. 2 Filament Transformer. Pri—115v 60 cycle; Sec. 1—14v 7 1/2 amp.; sec. 2 14v 7 1/2 amp. Series 28v 7 1/2 amp. Parallel 14v 15 amp.

Price only \$4.50

No. 3 Filament XMFR. Pri—115v 60 cycle; Sec. 24v 2 amps.

Price only \$2.25

• Speakers—Brand New Permanent Magnet

4" \$1.60
5" 1.85
12" Jensen in Metal Case 14.50
10% discount, purchase of 2 or more

• Heavy Duty Transmitting Chokes

8 HY—500 MA—5000 V INS.
Price each \$8.95

• Condensers—Fixed

.05 Mfd. 600 Volts	\$0.15
10 Mfd. 350 Volts	.69
15 Mfd. 150 Volts	.60
16 x 16 450 Volts	1.20
20 250 Volts	.69
40 150 Volts	.75
50 150 Volts	.69
150 25 Volts	.54
200 10 Volts	.45
8 x 8 Can. Electrolytic	1.50

Tubes (New, in Original Cartons).
For the SCR-274-N Command Set & Others.

12A6	69c	OD8- VF150	75c
12SR7	69c	12SA7	69c
12K8	69c	77	59c
12SK7	69c	78	59c
12SF7	69c	89	59c
1625	89c	38322	\$1.19
1626	79c	12J5-GT	69c
1629	89c		

ALL EQUIPMENT F.O.B.

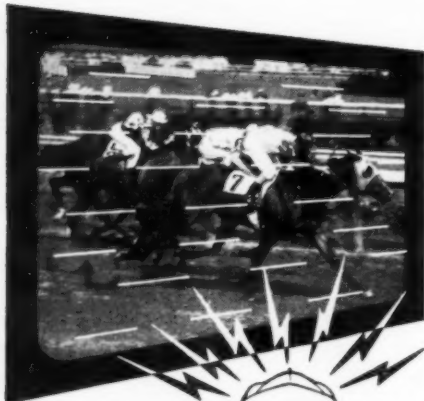
R & M RADIO COMPANY

2701 WILSON BLVD. DEPT. RN-59 ARLINGTON, VIRGINIA

May, 1949

• SAVE C.O.D. CHARGES and speed your order by remitting in full or 25% deposit. Please don't send money for postage, we ship "transportation charges collect." These prices supersede all previous prices. Write every month for BARGAIN BULLETIN.

...Help end spark plug INTERFERENCE



Spark Plugs are miniature broadcasting stations, send signals that interfere with radio reception, distort television. The New Auto-Lite "Resistor" Spark Plug reduces this interference.*



Recommend NEW AUTO-LITE Resistor SPARK PLUG

Here's How It Works to End Interference

The "Resistor" acts to dampen the spark plug radio signal to an acceptable level* while still delivering the full high voltage discharge required to ignite the fuel.



Auto-Lite Ignition Engineers, working with leading automotive manufacturers, have developed the new Auto-Lite "Resistor" Spark Plug with this built-in resistor that reduces spark plug interference.* Remember, the "Resistor" also helps deliver smoother idling, improved economy, longer electrode life. Dealers are being supplied as rapidly as possible. Write for Booklet M-1186 for full information.

THE ELECTRIC AUTO-LITE COMPANY
Toronto, Ontario Toledo 1, Ohio

*Under 35mv/m from 540 k.c. to 150 m.c. at 50 ft.

Tune in "Suspense," Thursdays, 9:00 P. M., E. T., CBS

B-1

to 20" as well as a projection television receiver with a 520" screen, will leave only 13 tubes to be wired. The change involves the pre-wired i.f. picture and sound strip, named the "Vivideo" feature, and the front ends.

NEW PHONOMOTOR UNITS

Many customers will find the new Alliance Dual-Speed 33½-45 r.p.m. phonomotor unit very economical for the new LP records.

This unit, together with a new single-play 45 r.p.m. record player, intended expressly for the newer records, will be made available in individual boxes to the radio-phonograph distributors. Although the Dual-Speed player assembly is primarily intended as a single player, the mechanism, consisting of motor and turntable, can also be adapted to changers.

The Alliance Manufacturing Company, Alliance, Ohio, started mass production of both models around March 1, and it expects a large volume of business from many consumers who will want to replace older-style players with the new assemblies.

MINIATURE LAMPS

Packaged in the familiar red, black, and white colors, a well-rounded line of miniature lamps has been an-



nounced by the RCA Tube Department, Camden, New Jersey.

These were planned to give the radio service dealer a wide assortment of lamps to take care of everyday replacement needs, and to fill practically every radio panel and flashlight need.

The line includes sixteen different types for radio panel and miscellaneous replacement use, and eight types for flashlight replacement purposes, and is available from RCA tube and parts distributors.

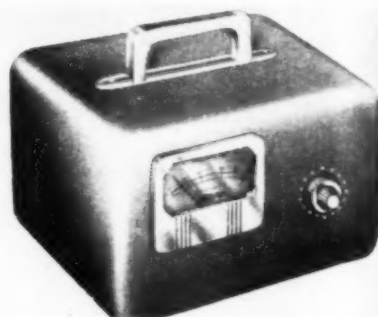
FIELD STRENGTH METER

The Transvision Model FSM-1 field strength meter which has been designed to facilitate television installations consists of a compact, high-gain receiver with a calibrated meter to indicate signal level. Each unit is individually calibrated. The instrument comes complete with self-contained power supply for operation at 120 volts, 60 cycles.

This compact, portable service instrument includes among other features a 13 channel selector. It measures actual picture signal strength besides losses or gain of various antenna and lead-in combinations. It is useful

for checking receiver reradiation; amplitudes of interfering signals can also be checked.

For further information write to



Transvision, Inc., New Rochelle, New York.

ALL-RECORD PHONOGRAPH

Arthur Ansley Manufacturing Company of Doylestown, Pennsylvania, announces the production of a portable phonograph that will play all types of records, both 33½ and 45 r.p.m., as well as the standard 78 r.p.m. discs.

The unit is housed in a compact, luggage-type case 13½ by 16 by 7¼ inches. It features a turntable with two spindle diameters, one for the standard and Columbia long-playing records, and one for the new RCA types.

INDOOR ANTENNA

The TVI-43 indoor antenna made available by the Ward Products Corporation is said to bring in all stations in metropolitan multi-station areas, precisely and brilliantly.

It is an attractive item, blending with most interiors, with chrome plated brass telescopic dipoles, and satin beige finish. Engineered and weighted so that it will not tip over, it will extend to a full 7 feet 9 inches, but can be stored without difficulty.



Further information on the TVI-43 will be supplied by the company, a division of the Gabriel Co. Address Ward Products Corporation, 1523 East 45th St., Cleveland 3, Ohio.

-30-

RADIO & TELEVISION NEWS

**NOW
SAME WEEK DELIVERY!**

34¹/₂¢
ea.

YOUR CHOICE

**LARGEST TUBE STOCK IN THE COUNTRY AT ROCK BOTTOM
PRICES. Cartoned and Guaranteed . . . 39c ea. in smaller quantities.**

34¹/₂¢
ea.

in lots of 100 or more

in lots of 100 or more

FREE!

Cornell-Dubilier, Mallory, Aerovex, Sprague,
Solar, Filter Condensers—ten fast moving
filters FREE with each 100 tubes.

**Popular GT Miniature and Localt Tubes. All individually car-
toned and guaranteed best quality. Available at this low price
and may be assorted. THE FIRST REAL SCOOP FOR THE
SERVICE DEALER.**

7Y4	5Y3GT	6K6GT	12A7	25L6GT	47
7Z4	5Y4G	6K7GT	12AT6	25Z5	50
7B6	5Z3	6P5GT	12AU6	25Z6GT	50B5
7E6	6A7	6Q7	12C8	26	50L6GT
7C4	6AC5GT	6Q6GT	12BA6	27	56
14X7	6A3	6R7	12BE6	30	57
1B4	6A8GT	6SA7GT	12F5	31	58
1C4	6AJ5	6SC7GT	12H6	32L7GT	70L7GT
1L4	6AQ6	6SD7GT	12J5GT	35	71A
1P5	6AT6	6SF5GT	12J7GT	35/51	75
1R5	6B6	6SF7	12K7GT	35B5	76
1S4	6B7	6SG7GT	12K8G	35C5	78
1S5	6BA6	6SH7	12Q7GT	35L6GT	81
1T4	6BE6	6SJ7GT	12SA7GT	35W4	83
1U4	6C4	6SK7GT	12SH7GT	35Z5GT	84/6Z4
1V	6C5GT	6SL7GT	12SG7	37	75
2A3	6C6	6SQ7GT	12SJ7GT	37A	112A
2A5	6C8G	6SR7GT	12SK7GT	38	89
2A7	6D6	6U7GT	12SN7GT	39	117Z3
2B7	6F5G	6V6GT	12SQ7GT	39/44	182B
3A4	6F6GT	6X4	12SR7	40	183
3Q4	6F8G	6X5GT	12SR7GT	41	482B
3S4	6G6	6Y6G	20	42	483
5U4G	6H6GT	10	2050	43	
5V4	6J5GT	12A8GT	2051	44	
5X4G	6J7GT	12A6	24A	46	

TELEVISION and FM TUBES

SPECIAL 49c in 100 lots assorted
each 54c ea. in smaller quantities.

1B3	6AL5	6S8GT	12AT7
2C34	6AQ5	6SN7GT	12AX7
2E24	6AU6	6SS7	12BA7
4A6G	6BD6	6T8	12S6
6J6	6BG6G	6W7G	19T8
6AG5	6BH6	6Z7G	
6AK5	6BJ6	12AU7	

CRITICAL TUBES

Sensational Low Price 54c
each in 100 lots assorted. 59c ea. in smaller quantities.

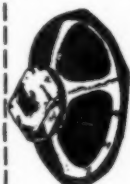
0Z4	1LC6	7A4	7Q7
1AD5	1LM4	7A7	7S7
1A5GT	1LN5	7E5	7W7
1A7GT	1N5GT	7F7	7X7
1G4GT	1Q5GT	7G7	117L7GT
1H5GT	2V3G	7H7	117P7GT
1J6G	3LF4	7J7	117Z6GT
1LA6	6U5	7N7	35Z4GT

IMPORTANT—100 lot prices also apply to mixed assortments of 34¹/₂c and 49c and 54c tubes. IF YOU WISH, tear out this page and send it in. Just write in quantities desired. Please print name and address plainly.



5 TUBE Super AC-DC KIT

Packed complete including tubes, plastic cabinet, all parts and the easiest, best instructions ever printed. Students, hobbyists, experimenters, hams—build your own radio, each. Quantity prices upon request. **\$11.95**



PM SPEAKERS

Nationally advertised brands—**GUARANTEED—best quality**
5" Alnico 5 Magnet.

4"	Lots of 10, ea. 95c
4"	Lots of 10, ea. 95c
4"	Lots of 10, ea. 95c
4"	Lots of 10, ea. 95c
4"	Individual price, ea. 95c
6"	Lots of 10, ea. \$1.49
6"	Individual price, ea. 1.59
8"	with output trans- former, ea. 3.65
10"	ea. 4.25
12"	ea. 4.95

BY-PASS CONDENSERS

7c each Lots of 100 (assorted) **\$5.95**

.001 mfd, 600V.—
ea. 7c
.002 " " " " " " " "
ea. 7c
.005 " " " " " " " "
ea. 7c
.01 " " " " " " " "
ea. 7c
.02 " " " " " " " "
ea. 7c
.05 " " " " " " " "
ea. 8c
.1 " " " " " " " "
ea. 9c



FILTER CONDENSERS

Highest Quality Standard Brands, All Fresh Stock Electrolytic.

60-60 mfd, 150V . . . ea. 47c
(Small size, low price, use in place of 60-40, 50-30, 50-50, 40-40, 30-30, etc.)

20-20 mfd, 150V . . .	ea. 39c
30-30 mfd, 150V . . .	ea. 47c
40-40 mfd, 150V . . .	ea. 49c
50-50 mfd, 150V . . .	ea. 49c
20 mfd, 150V . . .	ea. 25c
40 mfd, 150V . . .	ea. 29c

8 mfd, 450V . . .	ea. 24c
8-8 mfd, 450V . . .	ea. 43c
10-10 mfd, 450V . . .	ea. 43c
20-20 mfd, 450V . . .	ea. 39c
25 mfd, 25V . . .	ea. 17c
100 mfd, 25V . . .	ea. 17c

STOCK UP AT THESE PRICES

OUTPUT TRANSFORMERS

For: 50L6, 50B5, 50A5, 50C6, 32L7, 70L7, 26A7, 6W6, 28D7, 70A7, 1276, 6A5, 6B4, 25C6, 7C5, 2A3, 6A3, 6Y6, 25B6, 25L6, 6L6. . . each **39c**



For: 6V6, 6F6, 3Q5, 42, 41, 43, 45, 50, 71A, 12X5, 25A6, 25A7, 6N7, 6A6, 25N6, 25B5, 117L7, 117M7, 117N7, 117P7, 35A5, 6AH5, 6AL6. . . ea. **49c**

IF TRANSFORMERS

Standard replacement. **45c**
Each
Standard replacement. **45c**
Midset

VOLUME CONTROLS

500,000 ohms with switch and long shaft—best brands **35c**
ea.
2 MEG. with switch and long shaft **35c**
ea.

MISCELLANEOUS BUYS!

Crystal Cartridge
Standard replacement crystal cartridge . . . ea. \$1.49
6-Ft. Line Cords
Good rubber with plug . . . 10 for 1.25
Push-Back Wire
100-ft. rolls . . . per roll 49c
4-Prong Vibrators . . . ea. \$1.25
Selenium Rectifiers
Standard 100 mil . . . ea. 69c

UNIVERSAL OUTPUT TRANSFORMER SPECIAL—Up to 12 watts to almost any speaker . . . 99c ea.

All Merchandise is Brand New and nationally advertised brands.—Minimum order \$5.00; all shipments F.O.B. Chicago . . . **ORDER TODAY!**
20% additional on small orders outside continental United States. Low Price Catalog sent with first order.

**CLEAR-VAC CO. 5036 RAVENSWOOD AVE.
CHICAGO, ILLINOIS**

"Clear heads order from CLEAR-VAC"

ANNIVERSARY SALE

Prices Effective Until June 1st Only

A FEW "SPECIAL" SPECIALS

2" Simpson Meter 0-20 Ma (Amp Scale).....	\$1.49
3" Westinghouse Meter 0-20 Ma.....	2.75
6.3 V 10 Ma. Trans. Pri. 110/220V 60 Cy Cased.....	1.49
6 MFD 600 V DC—1 MFD 3000 V DC Oil.....	.69
10 MFD 600 V DC—2 MFD 1500 V DC Oil.....	.89
6 Henry 80 Ma 220 Ohm Chokes.....	2 for .79
Triple 1 MFD 1200 V DC Oil Cond.....	.49

SURPLUS METERS BRAND NEW

2" 0-5 Ma.....	\$1.95	2" 0-250 Volts DC.....	\$1.95
2" 0-3 Volts DC.....	1.95	3" 0-80 Ma DC.....	2.95
2" 150-0-150 Micro-amp.....	3.25	3" 0-100 Ma DC.....	2.95
2" 0-50 Amps DC.....	1.95	3" 0-75 Amps AC.....	2.95
2" 0-1 Ma Basic.....	2.75	3" 0-1 Ma DC.....	3.75
2" 0-200 Microamp.....	4.50	3" 0-15 Ma DC.....	2.95
2" 0-500 Ma.....	1.95	3" 0-200 Ma DC.....	3.75
2" 0-30 Volts DC.....	1.95	3" 0-2 Ma DC.....	3.75
2" 0-1 Amp RF.....	1.95	3" 0-150 Volts AC.....	3.95

CHOKE BARGAINS

20 HY 36 Ma.....	\$8.49	6 HY 300 Ma.....	\$3.39
6 HY 50 Ma.....	3 for .89	4.3 HY 620 Ma.....	6.49
8 HY 160 Ma.....	.99	.07 HY 7 Amps.....	4.25
1.5 HY 250 Ma 2 for.....	.89	7 HY 800 Ma.....	14.50
14 HY 250 Ma (10 HY 350 Ma).....	3.69		
Swing Choke 1.6/12 HY 1 Amp/100 Ma.....	19.95		

FILAMENT TRANSFORMERS

110V 60 Cy. Pri. Fully Cased			
5 Volt 15 Amp....	\$2.75	2.5 Volt CT 21 Amp.	\$4.75
2.5 Volt 10 Amp...	3.49	6.3 Volt 1.2 Amp...	.69
5 V CT 3 Amp....	1.49		

MULTIPLE SECONDARIES

5V CT 21A, 7.5V 6A, 7.5V 6A.....	\$4.95
10V CT 13A, 7.5V 2.5V.....	4.95
6.3V 21 Amp, 6.3V 2A, 2.5V 2A.....	3.95
5 Volt 4A, 6.3V 3A.....	2.45
2.5V CT 20A, 2.5V CT 20A.....	6.95
2.5V CT 10A, 10V 3A, 5V 3A, 5V 3A.....	3.95

OIL CONDENSERS

5MFD 150 V AC.....	\$8.45	4MFD 1000 V DC.....	\$8.89
20MFD 330V AC.....	1.75	15MFD 1000V DC.....	2.85
1 MFD 600V DC.....	.25	6MFD 1500V DC.....	2.75
2MFD 600V DC.....	.35	2MFD 2000V DC.....	2.15
4MFD 600V DC.....	.55	4MFD 2000V DC.....	3.55
3/3 MFD 600V DC.....	.59	6MFD 2000V DC.....	3.95
2 MFD 1000V DC.....	.69	2MFD 4000V DC.....	4.95

ADJUSTABLE RESISTORS (slider)

25 Watt: 1, 5, 50 ohms.....	\$8.19
50 Watt: 50, 100, 500 ohms.....	.29
75 Watt: 40, 80, 100, 150, 200 ohms.....	.35
100 Watt: 20, 50, 75, 120, 180 ohms.....	.35
150 Watt: 50, 100 ohms.....	.47
Deduct 10% quantities of 10 any type	

PLATE TRANSFORMERS—Fully Cased

110 Volt 60 Cy Pri.—Continuous Duty.....	
820 V. CT 775 MA.....	\$ 5.95
2370 V CT 250 MA, 225V Bias Winding.....	11.50
1120 V CT 600 MA 5V 6A, 5V 6A 6.3V 3A.....	8.95
3000V CT 600 MA Dual Pri.....	24.50
3000/2500V CT 1.5 Amp Dual Pri.....	37.50

UTC Type FA Output 5000 ohm plate to 500 ohm and 6 ohm 10 watt 60-10,000 CPS ± 1DB.....	\$2.49
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RECTIFIER TRANS. Pri. 110/220V 60Cy Sec. 0-70-75 Volts 3 amps Plus 35-37V (Pri. in Series) Fully Cased.....	\$1.89
---	--------

ADVANCE ANTENNA RELAY—110V 60 Cy			
coil—ceramic insulation.			
DPDT.....	\$1.95	3 PDT.....	\$2.50

DUNCO RELAY—6 Volt AC Coil

DPST.....	\$1.39	DPDT.....	\$1.69
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35 WATT WIRE WOUND RESISTOR

Ohms: 100-1500-4K-5K-10K-15K-40K.....	Each \$0.19
7 for.....	.99

SCOPE TRANSFORMERS

Pri. 110V 60Cy—Hermetically Sealed.....	
2500V @ 12 Ma.....	\$3.95
2300V @ 4 Ma, 2.5 Volts @ 2 Amp.....	4.95
1050V @ 20 Ma, 20V 4.5A, 2.5V 5A.....	4.75
4500V @ 4 Ma.....	8.50

SOLA CONSTANT VOLTAGE TRANS.

Pri. 95-125 Volts 60 Cy Sec 115V			
30 VA.....	\$10.95	120 VA.....	\$17.95

HERE'S VALUE

.004 1000 VDC Mic.....	10 for \$8.99
.01 600 VDC Mic.....	10 for .99
Federal Anti-cap Switch DPDT.....	.79
JAN 6C4 Tubes.....	4 for .99
25 MFD 25 VDC Electrolytics.....	7 for .99
10K and 15K Potentiometers.....	5 for .99
1/2 Med Potentiometers.....	3 for .99
1000 MFD 25 VDC Electrolytics.....	6 for .99
50 MFD 50 VDC Electrolytics.....	6 for .99
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Hammarlund MC2508-250MMF Var.....	2 for .99
ART 13 RF Vacuum Switch.....	1.69
15 Meg. 1% Carbon Resist.....	5 for .99
IRC 2 Meg 1/2 of 1% Meter Multipl.....	1.99
.02 2500 VDC Mica Cap.....	.99
Power Rheostat 8 ohms 150 watts.....	.99

If not rated 25% with order, Balance CDD Minimum \$3.00 Prices FOB NEW YORK

PEAK ELECTRONICS CO.

188 Washington St., New York 7, N. Y.

ASSIGNMENTS OF BOOTH SPACE IN THE 1949 RADIO PARTS & ELECTRONIC EQUIPMENT CONFERENCE & SHOW

MEMBER-EXHIBITORS

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ADVANCE ELECTRIC & RELAY CO.....	29
AEROVOX CORPORATION.....	86
AIRCRAFT-MARINE PRODUCTS.....	23
ALLANCE MANUFACTURING CO.....	145
ALPHA WIRE CORP.....	95
ALTEC LANSING CORP.....	107
AMERICAN CONDENSER CO.....	155
AMERICAN MICROPHONE CO.....	113
AMERICAN PHENOLIC CORP.....	109
AMERICAN RADIO HARDWARE CO.....	14
AMERICAN TELEVISION & RADIO CO.....	82
AMPEREX ELECTRONIC CORP.....	91
AMPERITE WIRE.....	45
ASTATIC CORPORATION.....	141
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AUDAK COMPANY.....	116
AUDIO DEVICES, INC.....	24
BARKER & WILLIAMSON.....	123
BELDEN MANUFACTURING CO.....	90
BELL SOUND SYSTEMS.....	40
BLILEY ELECTRIC COMPANY.....	7
DAVID BOGEN CO.....	44
BRITISH INDUSTRIES CORP.....	67
BRUSH DEVELOPMENT CO.....	41A
BUD RADIO, INC.....	96
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JAMES MILLEN MANUFACTURING CO.....	140
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NATIONAL UNION RADIO CORP.....	10
NEWCOMB AUDIO PRODUCTS CO.....	80
OHMITE MANUFACTURING CO.....	182
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PAR-METAL PRODUCTS CORP.....	136
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COMPANY NAME	DISPLAY ROOM NO.
AIRCRAFT-MARINE PROD.....	504A
AMERICAN PHENOLIC CORP.....	550A-551A
ATLAS SOUND CORP.....	513
BELDEN MFG. CO.....	501A
BELL SOUND SYSTEMS.....	524A
DAVID BOGEN COMPANY.....	542A & 544A
BATIST INDUSTRIES.....	601A-602A
BRUSH DEVELOPMENT.....	610-611
CENTRALAB DIVISION.....	610A-611A
CHICAGO TRANSFORMER DIV.....	557A & 561A
CRESCENT INDUSTRIES.....	512A
CRONAME, INC.....	501
EAGLE ELECTRONICS.....	523
ELLAR WOODCRAFT CORP.....	560A
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JOHN E. FAST & CO.....	521A
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GENERAL ELECTRIC CO.....	500
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E. J. GUTHMAN.....	656-657
THE HALLICRAFTERS CO.....	604A & 605A
HERMON HOSMER SCOTT, INC.....	609
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J. F. D. MANUFACTURING CO.....	521
JENSEN MANUFACTURING CO.....	505 & 560
KESTER SOLDER CO.....	502A
MARKEL ELECTRIC.....	516
THE MUTER COMPANY.....	512
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PHALOREN CORP.....	532A
PRESTO RECORDING.....	557
QUAM-NICHOLS.....	533A
RACON ELECTRIC CO.....	530A
RADIO CITY PRODUCTS.....	620A
RADIO CORP. OF AMERICA.....	656A-657A
RAULAND-BORG CORP.....	515A & 528A
REK-O-KUT.....	504
SANGAMO ELECTRIC CO.....	556A
WALTER L. SCHOTT.....	617
SHURE BROTHERS.....	517A
SIMPSON ELECTRIC CO.....	553A
MARK SIMPSON MFG. CO.....	605-607
SPIRLING PRODUCTS.....	612A
STACKPOLE CARBON CO.....	618-619
STAR PRODUCTS CO.....	535A-536A
STEPHENS MFG. CO.....	639A-640A
STROMBERG CARLSON.....	505A-507A
TALK-A-PHONE CO.....	618A-619A
THORADSON ELEC. MFG. CO.....	653-655
TRIPLETT ELEC. INS. CO.....	513A
TUNG SOL LAMP WORKS.....	537A
UNIVERSITY LOUDSPEAKERS.....	639-640
V-M CORPORATION.....	502A
WELLS MFG. CO.....	614A-615A
WILCOX-GAY CORP.....	502
WINCHARGER CORP.....	520
WORKSHOP ASSOCIATES.....	600-601

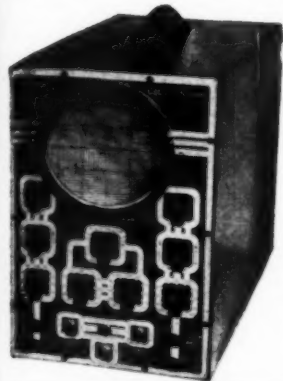
TRADE PRESS ROW

COMPANY NAME	BOOTH NO.
RADIO & TELEVISION NEWS.....	A
RADIO SERVICE DEALER.....	B
JOBBER NEWS.....	C
SERVICE MAGAZINE.....	D
RADIO & TELEVISION WEEKLY.....	E
RADCRAFT PUBLICATIONS.....	F
CALDWELL CLEMENTS.....	G
RADIO & TELEVISION JOURNAL.....	H
UNITED CATALOG PUBLISHERS.....	I

Convention will be held at the Stevens Hotel in Chicago, May 16 through May 20.

MONEY BACK GUARANTEE — We believe units offered for sale by mail order should be sold only on a "Money-Back-If-Not-Satisfied" basis. We carefully check the design, calibration and value of all items advertised by us and unhesitatingly offer all merchandise subject to a return for credit or refund. You, the customer, are the sole judge as to value of the item or items you have purchased.

BUILD YOUR OWN OSCILLOSCOPE and V.T.V.M. and SAVE!!



5" OSCILLOSCOPE KIT

Indispensable for AM, FM, and TELEVISION. Horizontal sweep circuit 15 to 30,000 cycles. All controls on front panel. Linear sweep with 884 gas triode. Graph screen for measuring peak to peak voltage. Frequency response of horizontal and vertical amplifiers from 50 cycles to 50 Kc. Input impedance 1 megohm and 50 mmfd. Etched panel for long life. Tube complement: 2-6XJ7, 2-6Y3, 1-884, 1-58P1. Provision for external synchronization, test voltage and intensity modulation. Deflection sensitivity: 30 volts per inch full gain. Detailed instructions and pictorial diagrams included. Operates from 105/130 V.A.C. 50/60 cy. Nothing else to buy!

\$39⁹⁵

VACUUM TUBE VOLTMETER KIT

THE MOST USEFUL TOOL ON THE RADIO BENCH!

D.C. and A.C. ranges 0-5, 10, 100, 500 and 1000 volts. Ohm-meter ranges from .2 ohms to 1,000 megohms in steps of Rx1, Rx10, Rx1000, Rx10,000 and Rx1 megohm. Db scale from -20 to +55. Db in 5 ranges. Diode A.C. rectifier. Large rugged 4 1/2" meter with all A.C. and D.C. readings on one simple scale. 1% accuracy. Complete tubes and test prods. Nothing else to buy!

\$23⁹⁵



THE NEW MODEL 670

SUPER METER



SUPER METER. A Combination VOLT-OHM-MILLIAMMETER plus CAPACITY REACTANCE, INDUCTANCE and DECIBEL MEASUREMENTS.

D.C. VOLTS: 0 to 7.5/15/75/150/750/1500/7500. A.C. VOLTS: 0 to 15/30/150/300/1500/3000 Volts. **OUTPUT VOLTS:** 0 to 15/30/150/300/1500/3000. D.C. CURRENT: 0 to 1.5/15/150 ma.; 0 to 1.5 Amps. **RESISTANCE:** 0 to 500/100,000 ohms, 0 to 10 Megohms. **CAPACITY:** .001 to .2 Mfd., .1 to 4 Mfd. (Quality test for electrolytics.) **REACTANCE:** 700 to 27,000 Ohms; 13,000 Ohms to 3 Megohms. **INDUCTANCE:** 1.75 to 70 Henries; 85 to 8,000 Henries. **DECIBELS:** -10 to +18, +10 to +38, +30 to +58.

The model 670 comes housed in a rugged, crackle-finished steel cabinet complete with test leads and operating instructions. Size 5 1/2" x 7 1/2" x 3".

\$28⁴⁰ NET

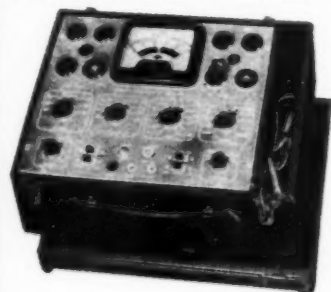
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★ Tests by the well-established emission method for tube quality, directly read on the scale of the meter. ★ New type line voltage.



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D.C. CURRENT: 0 to 1.5/15/150 Ma. 0 to 1.5 Amperes.

RESISTANCE: 0 to 5,000/50,000/500,000 Ohms, 0 to 50 Megohms.

Model 777 operates on 90-120 volts 60 cycles A.C. Housed in beautiful hand-rubbed cabinet. Complete with test leads, tubes, charts and detailed operating instructions. Size 13" x 12 1/2" x 6".

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The New Model 770—An Accurate Pocket-Size

VOLT-OHM MILLIAMMETER



(Sensitivity: 1000 ohms per volt)

Features:
Compact measures 3 1/4" x 5 1/4" x 2 1/4". Uses latest design 2% accurate 1 Mil. D'Arsonval type meter. Same zero adjustment holds for both resistance ranges. It is not necessary to readjust when switching from one resistance range to another. This is an important time-saving feature never before included in a V.O.M. in this price range. Housed in round-cornered, molded case. Beautiful black etched panel. Depressed letters filled with permanent white, insures long life even with constant use.

Specifications: 6 A.C. VOLTAGE RANGES: 0-15/30/150/300/1500/3000 volts.

6 D.C. VOLTAGE RANGES: 0-1 1/4/15/75/150/750/1500 volts.

4 D.C. CURRENT RANGES: 0-1 1/4/15/150 Ma. 0-1 1/2 Amps.

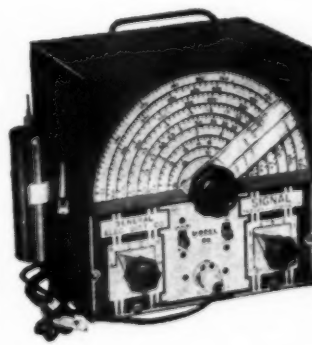
2 RESISTANCE RANGES: 0-500 ohms. 0-1 Megohm.

The Model 770 comes complete with self-contained batteries, test leads and all operating instructions.

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The Model 88—A COMBINATION

SIGNAL GENERATOR AND SIGNAL TRACER



Signal Generator Specifications:

*Frequency Range: 150 Kilocycles to 50 Megacycles. *The R.F. Signal Frequency is kept completely constant at all output levels. *Modulation is accomplished by Grid-blocking action which is equally effective for alignment of amplitude and frequency modulation as well as for television receivers. *R.F. obtainable separately or modulated by the Audio Frequency.

Signal Tracer Specifications:

*Uses the new Sylvania 1N34 Germanium crystal Diode which combined with a resistance-capacity network provides a frequency range of 300 cycles to 50 Megacycles. The Model 88 comes complete with all test leads and operating instructions. ONLY.....

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10, 100, 500, MA—10 AMP—100 MICRO AMP

OHMS:

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0-20 MEGOHMS (120,000 ohms center)

DECIBELS:

(5 ranges) —10 to +52 DB



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IN CANADA: BACH-SIMPSON, LTD., LONDON, ONT.

Ghost Elimination

(Continued from page 72)

each potentiometer must be adjusted to some particular value to obtain a proper match. That is, one potentiometer cannot be changed to compensate for the incorrect adjustment of another potentiometer.

Unless the relative magnitudes of receiver and line impedances are known, it is quite possible that the potentiometer pad will be tried the "wrong way" on the first trial, and no match will be found. In this case, the pad should be reversed and a match sought with the new connections.

If it is found impossible to eliminate the ghost with the variable pad, a defective transmission line is indicated. For example, there may be a break or short in one side of the line. Such defects can usually be detected by a visual or ohmmeter check.

Balanced Input, Unbalanced Line

When it is desired to operate a receiver with balanced input circuit from an unbalanced line, the input circuit may be arranged as shown in Fig. 4A. As an example, a 300-ohm balanced input circuit is shown in combination with a 75-ohm unbalanced line. One half of the input circuit is shunted with a 150-ohm resistor load. This 150-ohm dummy load provides correct loading for the unenergized half of the input. The other half of the input circuit is energized from the line through a pad designed to match 75 ohms to 150 ohms. The values for both resistances in this pad (as found in Fig. 4A) are 100 ohms.

Unbalanced Input, Balanced Line

When it is desired to operate a receiver with an unbalanced input circuit from a balanced line, it is possible to use the arrangement shown in Fig. 4B. In this diagram, a 300-ohm balanced line is shown properly matched to a 75-ohm receiver. It will be ob-

served that a 75-ohm dummy load is provided to maintain line balance to ground, thus preserving the antenna and line characteristics.

The receiver and dummy load together present a 150-ohm resistance to the 300-ohm line. Consequently, a pad which utilizes two 110-ohm resistors and one 220-ohm resistor is required to match the 300-ohm line to the input system. The pad indicated in Table 2 for matching a 300-ohm impedance to a 150-ohm impedance is comprised of two 220-ohm resistors. Because the line is balanced, however, the 220-ohm series resistance is split into two 110-ohm sections, with one section in each side of the line.

It should be noted that the noise-rejection feature claimed for a balanced line is lost in the circuit of Fig. 4B, because the receiver is energized from only one side of the line. Moreover, the matching losses are doubled when a dummy load is used. Thus, in the circuits given in Fig. 4A and Fig. 4B, the operating losses are about 12 db. This figure, however, is only about 6 db. more than the power loss encountered if a pad were not used. In strong-signal areas, satisfactory ghost-free reception can be obtained with these matching systems. In weak-signal areas, however, it may be necessary to forego these expedients and replace the transmission line with a line having characteristics which match the receiver.

It is interesting to compare the power loss due to mismatch with the power loss caused by the insertion of a matching pad. Such a comparison is given in Table 3. It can be seen from this tabulation that the power loss due to the addition of the pad for ghost-free reception is between 4 and 6 db. Except in critical areas of low signal strength, this loss is not troublesome. In critical areas, however, it is apparent that replacing the transmission line with one that matches the receiver may not only result in ghost-free reception, but in a signal increase of as much as 13 db.

Table 3. Power losses in typical unmatched and matched systems.

RECEIVER IMPEDANCE (OHMS)	LINE IMPEDANCE (OHMS)				
	53	75	105	150	300
72	$L_p = 5$ $L_m = 0.3$ $L_o = 4.7$		$L_p = 6$ $L_m = 0.6$ $L_o = 5.4$	$L_p = 8$ $L_m = 2.1$ $L_o = 5.9$	$L_p = 12$ $L_m = 6.9$ $L_o = 5.1$
100	$L_p = 7$ $L_m = 1.7$ $L_o = 5.3$	$L_p = 5$ $L_m = 0.4$ $L_o = 4.6$		$L_p = 6$ $L_m = 0.7$ $L_o = 5.3$	$L_p = 10$ $L_m = 4.5$ $L_o = 5.5$
150	$L_p = 10$ $L_m = 4$ $L_o = 6$	$L_p = 8$ $L_m = 1.9$ $L_o = 6.1$	$L_p = 5$ $L_m = 0.5$ $L_o = 4.5$		$L_p = 8$ $L_m = 1.9$ $L_o = 6.1$
300	$L_p = 13$ $L_m = 9$ $L_o = 4$	$L_p = 11$ $L_m = 6.5$ $L_o = 4.5$	$L_p = 10$ $L_m = 4$ $L_o = 6$	$L_p = 8$ $L_m = 1.9$ $L_o = 6.1$	

L_p Power loss due to insertion of pads in db.

L_m Loss due to mismatch in db.

L_o Additional operating loss under matched (ghost-free) conditions in db.



UPRIGHT CAPACITORS

Fig.	Mfd.	Voltage	Terminals	Mfrs.	Price
1	600VDC	2	2	Aer	35c, 3 for \$1.00
2	400VDC	2	2	Solar	35c, 3 for 1.10
3	600VDC	2	2	Micamold	35c, 3 for 1.10
4	600VDC	2	2	Solar	45c, 3 for 1.45
5	600VDC	2	2	Gudeman	55c, 2 for 1.05
6	400VDC	2	2	Aerovox	35c, 3 for 1.10
7	600VDC	2	2	Solar	35c, 3 for 1.00
8	600VDC	2	2	Aerovox	35c, 3 for 1.00
9	400VDC	2	2	CD	35c, 3 for 1.00
10	400VDC	2	2	Aer	40c, 2 for .75
11	600VDC	2	2	Gudeman	35c, 3 for 1.10
12	600VDC	2	2	Aer	40c, 2 for .85
13	600VDC	2	2	CD	50c, 2 for .95
14	600VDC	2	2	Tobe	55c, 2 for 1.00
15	600VDC	2	2	Gudeman	45c, 2 for .95
16	600VDC	2	2	Aer	45c, 2 for .85
17	600VDC	2	2	Gudeman	45c, 2 for .85
18	600VDC	2	2	G.E. Pyr	45c, 2 for .85
19	600VDC	2	2	G.E. Pyr	45c, 2 for .85
20	600VDC	2	2	G.E. Pyr	45c, 2 for .85

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115V 60cy Input Equip.	
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Fil. Trans: 6.3v/6A, 5v/2A	1.85
Fil. Trans: 5087: 6.3v/1A, 6.3v/7A	2.75
Fil. Trans: 5103: 6.3v/1A, 6.3v/1A	2.45
Fil. Trans: 5123: 6.3v/5A, 6.3v/1A	2.25
Fil. Trans: 5127: 6.3v/3.2A, 6.3v/1A	2.25
Fil. Trans: 7470674: 8.1v/1.5A	2.95
Fil. Trans: GE34V541: 2.5v/1.75A, 6.3v/8A, 5v/3A, 6.3v/6A	3.95
Plate Trans: U10885: 1620v/400MA	11.95
Comb. Trans: U8965: 78v/600MA 6.3v Fil.	4.00
Plate Trans: 15-3410: 800v/40MA, 760v/50MA	6.95
Plate Trans: 15-3415: 690v/450MA	4.95
Comb. Trans: 5111: 300v/42MA, 300v/42MA, 53v/125MA, 45v/35MA	4.50
Tab. Trans: 5102: 1080v/55MA, 6.3v/1.2A, 6.3v/1.2A	5.95
Comb. Trans: CS5608: 880v/150MA, 5v/3A, 6.3v/6.25A	4.50
Comb. Trans: KS4931: 585v/86MA, 5v/3A, 6.3v/1.8A	4.25
Comb. Trans: 5055: 525v/75MA, 5v/2A, 6.3v/1.8A, 10v/2A	4.45
Plate Trans: 68G699: 300v/300v/150MA	2.25
Auto Trans: 34J36: 90v, 80, 70v, 1 Amp	2.95

Send for List of Many Others Available

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Chokes: .03Hy, 2A	\$1.25	8.5Hy, 125MA	\$1.50
Chokes: 25Hy, 65MA	1.00	6Hy, 150MA	1.50
Chokes: Dual 7Hy, 75MA			
1Hy, 60MA	1.65	7Hy, 1403A	1.60
Chokes: Dual 2Hy, 100MA	.75	Dual 2.5Hy, 130MA	1.25
Chokes: 16Hy, 150MA	4.25	0.1Hy, 2.5A	1.45
Chokes: 35Hy, 350MA	7.25	Dual 3Hy, 330MA	1.00
Chokes: 5Hy, 40MA	.55	2Hy, 200MA	.75
Chokes: Dual 120Hy, 17MA	2.45	30Hy, 20MA	.85
Chokes: 5Hy, 200MA	1.45	2.1Hy, 200MA	1.20

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 PLATE TRANSFORMER: Pri: 117 v. 60 cy. Sec. 17,000 v. @ 144 ma. with choke. Oil immersed. Size: 26"x29"x13" Amertran \$120.00
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THERMISTOR BRIDGE: Power meter 1-203-A, 10 cm. mfg W.E. Complete with meter, interpolation chart, portable carrying case. \$72.50
 Bell Labs. Dual Mount mixer-beacon assemblies, 2 complete mixer-beacon mounts on gold-plated waveguide section. \$50.00
 Slotted Line, Bell Labs. 1 1/2"x5/16" guide, gold plated. \$150.00
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10.1	150	1450	17000	57000
43.5	200	1900	17300	75000
50	250	2230	20000	Write
75	300	4300	25000	for
Above Sizes, Each 30c	468	5000	30000	List of
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	200000	500000		Types
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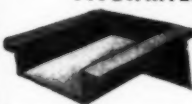
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BATHTUB CAPACITORS

Fig.	Mfd.	Voltage	Terminals	Price
1	3X.1	600VDC	3	33c, 4 for \$1.29
2	3X.1	400VDC	3	33c, 4 for 1.29
3	3X.1	400VDC	3	20c, 5 for .95
4	2X.1	600VDC	3	29c, 3 for .85
5	2X.1	600VDC	3	18c, 5 for .85
6	2X.1	600VDC	3	40c, 2 for .75
7	2X.25	600VDC	3	29c, 3 for .85
8	2X.25	600VDC	3	29c, 3 for .85
9	2X.25	600VDC	3	29c, 3 for .85
10	2X.25	600VDC	3	29c, 3 for .85
11	2X.25	600VDC	3	29c, 3 for .85
12	2X.25	600VDC	3	29c, 3 for .85
13	2X.25	600VDC	3	29c, 3 for .85
14	2X.25	600VDC	3	29c, 3 for .85
15	2X.25	600VDC	3	29c, 3 for .85
16	2X.25	600VDC	3	29c, 3 for .85
17	2X.25	600VDC	3	29c, 3 for .85
18	2X.25	600VDC	3	29c, 3 for .85
19	2X.25	600VDC	3	29c, 3 for .85
20	2X.25	600VDC	3	29c, 3 for .85

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175 mmf	±2.5 mmf
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Fig.	Mfd.	Voltage	Mfd.	Price
D	.01	1200 WVDC	Aer	\$.50: 2 for \$.95
E	.00025	2500 WVDC	Spra	.29: 2 for .55
D	.00004	2500 WVDC	Micamold	.39: 2 for .75
E	.000047	2500 WVDC	Micamold	.39: 2 for .75
E	.01	500 WVDC	Micamold	.25: 2 for .45
C	.002	3000 WVDC	CD	1.05: 2 for 2.00
C	.01	2000 WVDC	GD	1.50: 2 for 2.90
C	.00003	2000 WVDC	Sang	.49: 2 for .95
C	.00009	3000 WVDC	Spra	.75: 2 for 1.45
C	.00032	3000 WVDC	Sang	1.00: 2 for 1.95
C	.002	3000 WVDC	CD	1.00: 2 for 1.95
C	.005	5000 WVDC	CD	1.65: 2 for 3.25
C	.004	6000 WVDC	Sang	1.50: 2 for 2.95
C	.0006	3000 WVDC	Spra	1.00: 2 for 1.95
C	.0008	3000 WVDC	Spra	.95: 2 for 1.85
E	.0016	3000 WVDC	Sang	.65: 2 for 1.25
E	.000090	3000 WVDC	Sang	.40: 2 for .75
B	.08	1500 WVDC	Sang	10.00: 2 for 19.50
B	.03	2000 WVDC	Sang	12.00: 2 for 23.50
B	.045	2000 WVDC	Sang	12.00: 2 for 23.50
B	.00015	2000 WVDC	Sang	24.00: 2 for 47.50
B	.0001	2000 WVDC	Sang	24.00: 2 for 47.50
B	.002	1500 WVDC	Sang	19.00: 2 for 37.50
C	.006	2500 WVDC	Sang	1.45: 2 for 2.85
E	.00027	2500 WVDC	Micamold	.35: 2 for .65

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D-170908: 0.152 mfd, 300 v, 400 cy, —50 to plus 85 deg C	2.50
D-164960: 2.04 mfd, @ 200 vdc, 0 to plus 55 deg C	2.50
D-168344: 2.16 mfd @ 200 vdc, 0 to plus 55 deg C	3.00
D-161555: .5 mfd @ 400 vdc, —50 to plus 85 deg C	3.00
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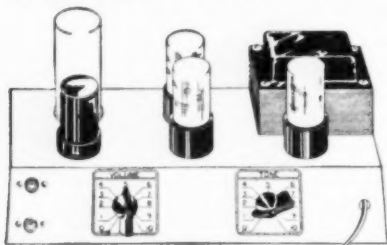
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Television Receivers

(Continued from page 66)

second detector. This means that the amplitude of the sound carrier should be reduced to about 5 per-cent of the maximum picture carrier amplitude. In order to achieve this, the i.f. system through which both signals pass is designed to have the response characteristic shown in Fig. 5. At the frequency of the sound i.f. carrier, the response curve is 26 db. down from the video carrier frequency point.

After passage through the i.f. system, the signals are fed to the video detector, where the i.f. frequencies are removed, leaving only the video frequencies, which extend from 0 to 4.0 mc. and the 4.5 mc. beat note that is produced when the two carriers beat against each other.

At the output of the video second detector, the complete signal, including the 4.5 mc. voltage, is usually passed through the video-frequency amplifiers. The sound signal, it must be remembered, was reduced considerably in the i.f. system and thus requires a corresponding increase in amplification following the video second detector in order to bring it back to a usable value. Even after passage through the video-frequency amplifiers, its average level seldom exceeds one or two volts. Thus, what is done is to transfer this voltage out of the video system into an audio i.f. amplifier, tuned to 4.5 mc., and after one stage of amplification, apply it to an FM detector for conversion into audio frequencies. Thereafter, one or two audio amplifiers bring the signal to the desired strength for normal operation of a loudspeaker.

We might pause and note here that the actual number of stages devoted exclusively to the sound signal is less in the Intercarrier system than in conventionally designed sets. This usually means a savings of two to three stages.

One way to remove the 4.5 mc. voltage from the video system is to employ a series resonant trap, connected from the plate of the final video-frequency amplifier to ground. See Fig. 6. The voltage developed across the coil is amplified by a 6BA6 4.5 mc. amplifier and then made available to the FM detector. Through the use of a series resonant circuit, essentially all of the 4.5 mc. voltage is removed from the video path and thereby does not reach the cathode-ray tube. The 6BA6 operates as a limiter and serves to present a fairly constant output when widely varying signals are applied to its input. This is desirable, especially if some form of tuning control is provided, otherwise the set user might attempt to tune for loudest sound, which would seriously distort the picture.

We are now in a position to appreciate fully the reasons for the reduction in sound carrier prior to the video second detector. First, if the video and

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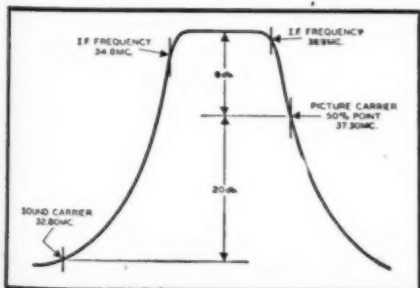
audio carriers are comparable in strength when they reach the video second detector, the resultant 4.5 mc. beat note will contain a considerable amount of amplitude modulation. Also, the amount of this amplitude modulation will vary as the modulation of the video carrier changes. Since no FM detector now in practical use is able to completely remove or ignore amplitude modulation in an FM signal, the audio output will be distorted to an extent dependent upon the amount of amplitude modulation present in the signal. Even the use of a limiter prior to the detector does not altogether alleviate this trouble. With the amplitude of the sound carrier equal to about 5 per-cent of the video carrier, the 4.5 mc. beat note amplitude remains substantially constant as the level of the video carrier varies between 15 to 100 per-cent of its peak value.

Another consideration in conjunction with the use of comparable audio and video carriers is the manner in which the audio voltage can affect the picture. The sound carrier, it is known, is frequency modulated and one way to convert an FM signal into an audio voltage is by means of slope detection. Now, if the sound signal receives 26 db. less amplification than the video signal in the i.f. system, it will be quite small and even if 30 per-cent of this signal suffers slope detection at the video second detector, the interference from this source will be approximately 33 db. below the video signal and generally unnoticeable. However, if the audio signal is large at the detector, then even 10 per-cent slope detection will produce enough audio voltage to develop horizontal bars across the screen. It will probably be found that with a large audio signal, more than 10 per-cent slope detection occurs, further aggravating the situation.

If the 4.5 mc. signal itself reaches the control grid of the cathode-ray tube, a fine line pattern will appear on the screen. This will occur if the audio signal is strong at the video detector output and does not receive the proper amount of attenuation. However, if the audio signal is reduced by the 26 db. specified above, then its effect, after the shunting effect of the series resonant pick-off circuit, will be so small as to be negligible.

Thus, we see from the foregoing why it is mandatory for the video car-

Fig. 8. The i.f. response curve of the Tele-Tone 7" receiver diagrammed in Fig. 7.



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rier to be considerably stronger than the audio carrier, at the video detector, if the Inter-carrier system is to function properly. It also explains why the presence of the sound signal, even as far as the last video-frequency amplifier, does not materially affect the image on the screen.

In receivers employing the conventional system, it has recently become common practice to insert a 4.5 mc. trap in the grid or plate circuits of the first video-frequency amplifier following the video second detector. This is done to prevent any 4.5 mc. voltage, which may be generated in the video detector from reaching the cathode-ray tube. In the mass production of many television receivers, the sound carrier may not receive the full attenuation required to suppress it completely. Hence this additional precaution.

To see how the Inter-carrier system is applied commercially, let us analyze a receiver operating on this principle.

Tele-Tone Television Receivers

The *Tele-Tone 7* receiver diagram is shown in Fig. 7. The front end of the receiver contains a 6AU6 r.f. amplifier, a 6AG5 mixer, and a 6J6 push-pull oscillator. Examining this section of the receiver briefly, we find that the antenna signal is fed between the grid and cathode of the r.f. amplifier in a balanced arrangement, against ground, so as to properly terminate a 300-ohm transmission line. The input circuit is untuned, the input coil, L_1 , serving as part of a high-pass filter designed to permit all the television signal frequencies to pass but to attenuate extraneous signals at the i.f. frequency. For strong local signals, an attenuator pad is provided (not shown) to prevent overloading of the amplifiers with resultant distortion to the image and sound.

The plate circuit of the r.f. stage is tuned by what is, electrically speaking, a single tapped inductance. Mechanically, this coil takes the form of several individual coils which are cut in or out of the plate circuit by the rotary 12-position band switch.

The 6J6 oscillator is a push-pull arrangement with the coil for channel 2 (the present first channel) permanently in the circuit. For the remaining channels, 3—13, a second coil is placed in parallel with this coil, reducing the oscillator frequency to the proper value. Each coil is tuned by brass slugs accessible from the front panel. The output from the r.f. amplifier and the oscillator are condensed fed to the grid of the 6AG5 mixer tube. Additional transfer of energy by means of a single turn of link coupling is provided between the r.f. amplifier and the mixer for the upper channels.

The oscillator, in this receiver, operates above the incoming audio and video carriers on all channels. In Inter-carrier sets this need not be true as we will see in a later set. The video carrier i.f. is 37.3 mc. and the sound carrier i.f. is 32.8 mc.

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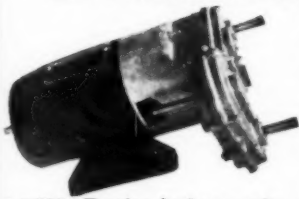
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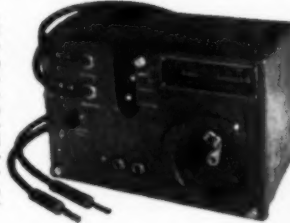
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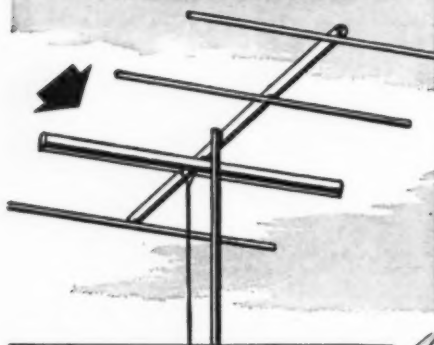
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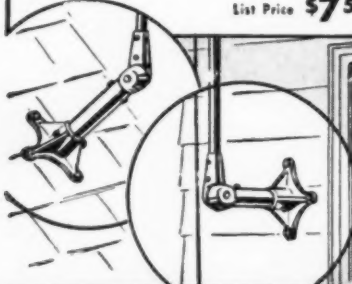
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City _____ Zone _____ State _____

The i.f. system contains 3 stages, two of which employ transformer coupling and the third impedance coupling. Each i.f. transformer has only one adjustment, a powdered iron slug accessible from the top of the chassis. The i.f. string is stagger-tuned to two frequencies, 34.8 mc. and 36.9 mc., resulting in the over-all response characteristic shown in Fig. 8. The curve is fairly flat-topped and the amplification accorded the sound carrier is 20 db. less than that received by the video carrier frequency. (The previous 26 db. figure specified would be a more desirable value. However, in commercial sets values from 18 to 26 db. will be found. With the smaller figure we obtain a larger sound voltage at the pick-off point and this can be used to advantage in designing the audio system. On the other hand, there are the pitfalls previously described when the sound carrier level approaches closer to the video signal amplitude.)

The video second detector is an AM half-wave rectifier, incorporating high-frequency compensation in order to maintain the circuit response for the high video frequencies and the 4.5 mc. beat frequency. The signals are amplified by one stage of video frequency amplification after which the sound carrier is tapped off the plate of the video amplifier by a 4.5 mc. trap and fed through a 4.5 mc. sound i.f. amplifier to a ratio detector, and then to the sound amplifier, audio output, and speaker. The coupling network between the plate of the video amplifier and the cathode-ray tube will pass most of the video frequencies but attenuate any of the 4.5 mc. voltage that may attempt to pass through. From the output circuit of this same video amplifier, a portion of the signal is

also fed to a sync separator and d.c. restorer tube. Sync systems in Inter-carrier television receivers are similar to the sync networks in conventional television receivers. The use of an Inter-carrier sound system does not affect this portion of a television receiver.

A word about the 4.5 mc. take-off trap in the plate circuit of V_2 , the video amplifier. At first glance the trap appears to be a parallel resonant circuit. However, the 2.2 μ fd. condenser, in conjunction with the coil and 68 μ fd. condenser across the coil, form a series resonant circuit at 4.5 mc. The 68 μ fd. condenser neutralizes enough of the inductance of the coil to which it is connected so that what inductance remains can resonate with the 2.2 μ fd. series condenser at 4.5 mc. The operation here is identical with the series resonant traps used in the video i.f. systems of some conventional television receivers. This was previously described in detail.

The Tele-Tone receiver uses an a.g.c. circuit controlling the r.f. and the first two i.f. stages. The a.g.c. voltage is developed by a separate diode section of the 6AL5; the other section of this tube is the video detector. It is important to remember, when aligning the i.f. system, that the sound carrier marker appears at a point which is roughly 20 db. down from the level of the video carrier. Furthermore, the video carrier should be 50 per-cent down (i.e. 6 db.) from the maximum amplitude of the response characteristic. Other receivers employing a similar circuit design are the Sentinel models 400-TV and 450-TVM receivers, the National model NC-TV7 receiver, and the Hallicrafters models T-54 and T-505.

(To be continued)

The radio service business is booming in the Tanganyika Territory as this picture will prove. H. S. Bharj of Moshi sent along this photo showing a friend of his catching up on his repair work on a Sunday. Because of a power failure that Sunday he had to do his soldering with a non-electric iron. The test equipment is British-made.





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1B24	4.95	75TL	3.95	878	2.49	T20	1.50	5V4G	.96	6SJ7GT	.66
1B25A	4.95	100TH	12.95	884	1.49	T55	3.95	5W4	1.06	6SK7	.66
1B26	4.95	100TS	3.00	885	.98	T200	10.95	5W4GT	.66	6SK7GT	.66
1B27	4.95	114A	.69	891	110.00	TZ20	1.50	5X4G	.72	6SL7GT	.96
1B29	.89	114B	1.25	892	110.00	TZ40	2.95	5Y3GT	.42	6SN7GT	.88
1B32	4.95	120	5.95	902P1	7.95	UP50	5.95	5Y4G	.60	6SQ7	.60
1B36	4.95	121C	2.65	904	9.95	V700	6.95	5Z3	.72	6SO7GT	.60
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1B56	4.95	211	.98	913	7.95	VR78	.75	6A3	1.28	6SR7GT	.72
1C21	1.29	215A	3.00	918	2.95	VR90	.75	6A6	1.06	6SN7	.66
1P23	1.95	217C	7.30	923	.98	VR91	1.49	6A7	.80	6ST7	.88
1S21	1.96	218	49.50	925	1.40	VR105	.98	6A8	.80	6SV7	.88
2AP1	3.95	221A	2.95	929	1.25	VR150	.75	6A8GT	.80	6T7G	1.24
2C4	1.18	231D	1.49	930	1.10	VT127A	3.00	6AB5 6N5	.88	6U5 6G5	.72
2C21	.98	240C	3.49	931A	4.95	VU111	1.19	6AB7 185J	1.06	6U6GT	.72
2C22	.39	250R	7.95	934	.75	WL460	1.19	6AC3GT	1.16	6U7G	.72
2C26A	.28	250TH	19.50	955	.75	WL468	14.95	6AC7 1852	1.16	6V6	1.28
2C34	.59	250TL	19.50	956	.75	WL532A	4.95	6AD6	.88	6V6GT	.80
2C40	1.96	252A	4.95	957	.75	WL562	150.00	6AD7G	1.28	6W7G	.88
2C43	7.50	254	19.95	958A	.75	WL616	105.00	6AF6	1.25	6X4	.60
2C44	1.75	259A	4.95	959	2.95	WU111	1.19	6AG5	1.06	6X5GT	.60
2C46	3.60	274A B	1.25	991	.75	ZB120	6.95	6AG7	1.28	6Y6G	.96
2D21	1.18	282A B	9.95	1008	4.95	ZP477 12DP8	14.95	6AH6	1.56	6Y7G	.88
2D22	1.50	306TH	6.95	1011	.98	0A2	1.65	6AJ5	.99	6Z7G	1.28
2E24	4.95	304TL	1.49	1013	.75	0A3 VR75	.98	6AK5	1.56	6ZY5G	.88
2E25	4.25	307A	4.95	1014	1.75	0A4G	1.06	6AK6	.88	7A4 XXL	.72
2E26	4.95	316A	4.95	1015	1.39	0Z4G	.88	6AR3	.66	7A5	.72
2E30	2.49	322A	8.95	1019	.75	0B3 VR90	.75	6AS7G	4.95	7A6	.72
2J21A	12.39	327A	4.95	1020	4.95	0C3 VR105	.98	6AQ5	.80	7A7	.72
2J26	8.95	331A	5.95	1021	1.98	0D3 VR150	.75	6AQ6	.72	7A8	.72
2J31	10.95	338A	4.93	1022	1.75	0Y4	.88	6AO7GT	.88	7AD7	1.06
2J32	13.95	350A B	2.95	1024	1.75	0Z4	.88	6AR3	.66	7AF7	.72
2J33	24.95	354C D	19.95	1025	.49	01A	.50	6AT6	.60	7AG7	.72
2J34	24.95	368AS	4.93	1026	4.95	01A	.50	6AT6	.60	7AH7	.88
2J37	17.95	371A B	.89	1028	4.95	1A3	.72	6AU6	.80	7B4	.72
2J38	13.95	393A	7.95	1029	.69	1A4	1.28	6AV6	.60	7B5	.72
2J49	24.95	394A	4.50	1031	1.50	1A4P	1.56	6B4G	1.28	7B6	.72
2J51	24.95	417A	4.50	1034	1.10	1A5GT	.72	6B6	.88	7B8	.72
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2K28	24.95	450TH	24.95	1038	.98	1B3GT	1.49	6B8	1.28	7C5	.72
2K33	34.95	464A	7.50	1041	.79	1B4	1.56	6B8G	1.28	7C6	.72
3AP1	4.95	527	12.95	1042	.98	1B5 25S	1.28	6BA6	.80	7C7	.72
3B22	4.95	531A	1.49	1049	1.49	1B7GT	1.06	6B6	.88	7C8 1201	1.06
3B23	4.95	575A	14.95	1051	1.25	1C5GT	.88	6BG6G	1.92	7E6	.72
3B24	1.98	701A	4.95	1052	1.06	1C6	1.28	6BH6	.80	7E7	.72
3B26	1.89	703A	4.95	1053	1.06	1C7G	1.28	6BJ6	.80	7F7	.72
3B27	3.95	705A	2.95	1060	.95	1D5GP	1.55	6C4	.39	7F8	1.06
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3C23	4.95	710A	2.95	5516	5.95	1E7G	1.56	6C7	1.28	7K7	1.06
3C24	.69	713A	1.65	5562	10.00	1F4	1.06	6C8G	1.28	7L7	.88
3C30	1.50	714AY	6.95	7193	.39	1F5G	1.06	6D6	.66	7N7	.88
3CP1	3.00	715A B	9.95	8003	5.95	1F6	1.56	6D8G	1.28	7O7	.72
3D21A	3.95	715C	24.95	8005	4.95	1F7G	1.56	6E6	1.06	7P7	1.06
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3FP7	3.95	723AB	7.95	8014A	24.95	1H5GT	.66	6F6GT	.66	7Y4	.72
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4-65A	14.50	726A	3.95	8025	7.95	1H6GT	1.28	6F8G	1.28	10	.69
4-125A	7.50	726A	23.50	8025	7.95	1J6GT	1.28	6G6G	1.06	12A	.60
4-250A	37.50	750TL	49.50	C5B	12.95	1L4	.80	6H6	.60	12A6	.39
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4AP10	6.95	801A	.98	CE072	1.95	1L6A	1.06	6J5	.54	12A7	1.28
4B24	4.95	802	3.75	CK1006	.49	1L8A	1.06	6J5GT	.54	12A8GT	.88
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4J26	110.00	805	5.95	EF50	.79	1L8A	1.06	6J7GT	.80	12AT6	.60
5AP1	4.95	807	1.25	EL1C	4.95	1L8A	1.06	6J8G	1.28	12AT7	1.16
5AP4	5.95	808	1.89	EL3C	4.95	1L8A	1.06	6K5	.88	12AU6	.80
5BP1	4.95	809	2.95	F160A	12.95	1L8A	1.06	6K6GT	.60	12AU7	.96
5BP4	4.95	810	7.95	FG17	3.25	1L8A	1.06	6K7	.66	12BA6	.72
5CP1	3.95	811	2.45	FG27A	9.95	1L8A	1.06	6K7GT	.66	12B6	.72
5CP7	13.95	812	2.95	FG33	8.95	1L8A	1.06	6K8	.96	12C8	.69
5D21	29.95	812H	6.95	FG67	12.95	1L8A	1.06	6K8GT	.96	12F5GT	.72
5FP7	3.95	813	8.95	FG81A	9.95	1L8A	1.06	6L5G	.88	12H6	.39
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5HP4	9.95	815	2.95	FG123A	32.50	1L8A	1.06	6L6G	1.16	12J7G	.80
5J2P	11.95	816	1.19	FG235	59.50	1L8A	1.06	6L7	.96	12J7GT	.80
5LP1	11.95	826	.69	FG238B	160.00	1L8A	1.06	6L7G	1.16	12K8	.66
5LP5	14.95	828	6.95	GL146	11.00	1L8A	1.06	6L8	1.56	12K8GT	.96
5NP1	2.95	829A B	7.95	GL502A	1.98	1L8A	1.06	6L8GT	.96	12O7GT	.72
6AP6G	.88	829B 3E29	4.95	GL530	49.50	1L8A	1.06	6L9	.88	12SA7	.66
6C21	24.95	830	2.95	GL559	5.35	1L8A	1.06	6L9GT	.88	12SA7GT	.66
6D4	1.29	830B	5.25	GL697	150.00	1L8A	1.06	6Q7	.80	12SC7	.72
6F4	5.95	832 A	4.95	HF100	3.95	1L8A	1.06	6Q7GT	.72	12SF5	.80
6J4	6.50	833A	34.50	HY65	2.49	1L8A	1.06	6R7	1.06	12SF5GT	.80
7BP7	4.95	834	5.95	HY75	1.25	1L8A	1.06	6R7GT	.80	12SF7	.80
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12GP7	14.95	864	.69	RE136	2.95	1L8A	1.06	6S7GT	.66		
12HP7	14.95	865	.69	RE136	2.95	1L8A	1.06	6S7GT	.66		
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Regenerative Receiver

(Continued from page 63)

warmed up, turn the audio gain control to about the half-way position and then commence turning the regeneration control towards maximum position until a rushing noise or squeal is heard on the loudspeaker. The squeal would indicate that the set was tuned to exactly the same frequency as the carrier of some station. A slight decrease in regeneration control will remove the squeal and allow the station to be heard. Slight adjustment of the

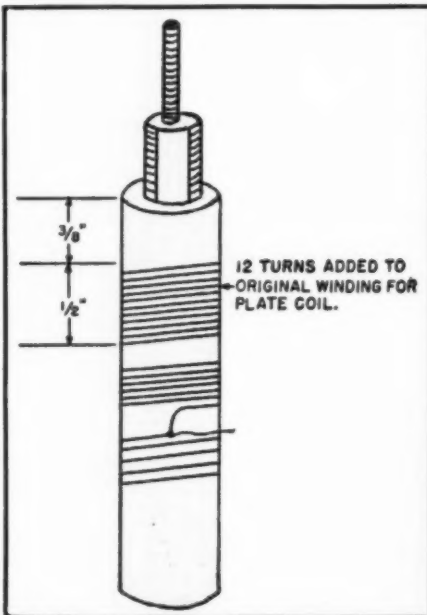
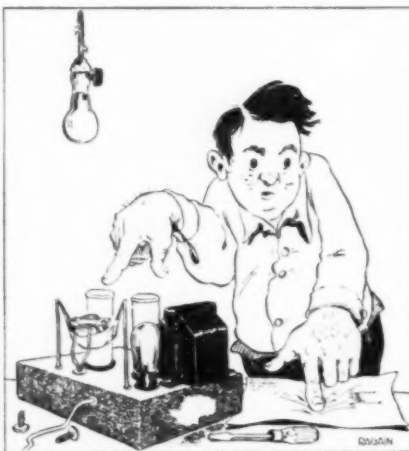


Fig. 5. Mechanical details of oscillator coil. Twelve turns are added, as shown above, to a Stanwyck S-231 coil.

main tuning dial may be in order to get best reception. For reception of C.W. or Morse code signals, it will be necessary to set the regeneration control higher so that the squeal or chirping noise of the C.W. may be heard at all times. A little experience in adjusting this unit will allow the reception of many foreign broadcast stations and local and foreign amateurs. —30—



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Technical BOOKS

"RADAR PRIMER" by J. L. Horning. Published by *McGraw-Hill Book Company, Inc.*, New York. 213 pages. Price \$3.50.

Although most persons probably think of radar only in terms of a military "weapon," in reality this warborn device is today filling many highly important civilian roles.

It is for this new segment of the population whose work deals with the various phases of radar that this book has been written. While the author has carefully adhered to the "primer" type of presentation and has avoided the use of technical terminology wherever possible, he doesn't "talk down" to his readers.

The book is divided into eight chapters which cover the fundamentals of radar, determining distance and direction, "electrons paint a picture," the basic parts of a radar set, radar at work, long distance navigation, microwaves and pulses, and the history of radar.

Airline employees and shipping line personnel will find this book of particular value because of the special emphasis placed on radar applications in these fields.

"THE RECORDING AND REPRODUCTION OF SOUND" by Oliver Read. Published by *Howard W. Sams & Co.*, 2924 E. Washington St., Indianapolis, Ind. 304 pages. Price \$5.00.

The author has analyzed and appraised the host of circuits, equipment, accessories, and philosophies that have been developed about this extensive subject. An avid enthusiast on high fidelity recording and reproduction and a critical experimenter in all phases of the art, Mr. Read presents his material with the authority born of practical experience in his own laboratory, with all types of record-playback equipment. Noted for his easy-to-read style in rendering technical information, his presentation of all phases of this subject is accomplished with unusual clarity. Evolving his subject from a complete history of sound and the behavior of sound waves, the author fully covers all basic media for making recordings with a detached analysis of their respective merits. Auxiliary equipment is fully covered and amply illustrated in the text.

The handbook provides excellent coverage of acoustical systems for the reproduction of sound and a complete analysis of the various types of amplifiers, together with their individual applications.

"COYNE ELECTRICAL TROUBLE SHOOTING MANUAL" by The Coyne Staff. Published by *Coyne Electrical Radio School*, Chicago. 626 pages. Price \$6.95.

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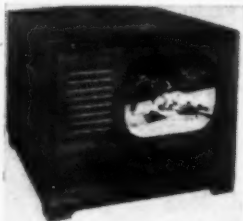
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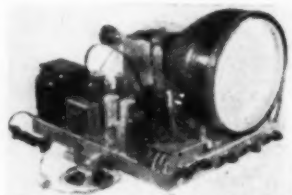
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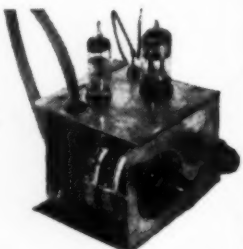
Sparkling new Telekit 10-B has 52-inc. screen. Brand new compact lay-out has video tube mounted on chassis. Big illustrated easy-to-follow instruction book guides you step by step through easy assembly. No special knowledge of television is required. All you need is a soldering iron, pliers, and screw driver. Telekit 10-B, \$99.50. Tube kit, including 10BP4 and all other tubes, \$59.30. 10-B Telekit cabinet \$24.50. Telekit Guarantee includes free factory service.

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TELEKIT

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1432 NORTH BROAD STREET PHILADELPHIA 7, PA.

Almost the entire 626 pages of this manual are devoted to wiring diagrams of equipment which the average industrial technician is likely to encounter in his work. The manual is divided into six main sections dealing with basic electricity, transformers, motors, controls, generators and converters, and electronics. These sections are further divided into divisions and applications.

According to the plan worked out by the authors, an electrician confronted by the problem of repairing a two-step magnetic controller for a d.c. motor would first consult the "subject matter" section of the "subject and application guide." After determining that the work falls into the "controls" classification, the user then breaks down the subject still further by selecting the subject "d.c. motors" under the main "control" classification. The "d.c. motors" category is subdivided and the user would select "magnetic, multi-step" as the application pertinent to the problem at hand.

Men whose daily work involves the repair, maintenance, and installation of all types of industrial electronic equipment will find this manual a help in cutting servicing time.

-30-

Beginning Amateur

(Continued from page 45)

doesn't even read it. Instead, he gives the application form back to the applicant and tells him to have it notarized. (One or more notaries can always be found in or near a Federal building.) All the papers are then forwarded to Washington for grading.

Notification of passing takes the form of the actual amateur license, with call letters marked on it. Failure brings only a form letter of regret. The usual wait for a license is about a month; for the less welcome notice, a couple of weeks. You cannot ask for specific call letters; you have to take what comes along.

The brand-new ham is eligible only for licenses of the Class B and Class C type. These involve the identical examination, but the difference lies in the manner of giving it. If you live within 125 miles of an FCC office or a point at which amateur tests are held periodically, you must appear in person and be checked by an FCC engineer, as described. If you live more than 125 miles from an examining point, you can obtain all the papers by mail from the nearest FCC office. You must arrange with a licensed operator to give you a code test and to certify that you answered the written part of the examination in his presence, without assistance. The government puts you on your honor in this deal! If you move into an area served by an FCC office less than 125 miles away, you must appear for an official re-examination within four months.

Class B and C licenses permit the holders to operate c. w. on any amateur band and phone above 27,160 kilocycles. The Class A license allows, in addition, the privilege of working phone in the so-called "20- and 75-meter" bands. Only hams with a minimum of one year's experience can apply for this license, which boasts a much stiffer examination than the

FCC offices where complete information on obtaining amateur licenses may be obtained.

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Radio district	Address of the inspector in charge Federal Comm. Comm.	Territory within district	
		States, etc.	Counties
1	Seventh Floor Customhouse, Boston 9, Mass.	Connecticut..... Maine..... Massachusetts..... New Hampshire..... Rhode Island..... Vermont..... New Jersey.....	All counties. Do. Do. Do. Do. Do. Bergen, Essex, Hudson, Hunterdon, Mercer, Middlesex, Monmouth, Morris, Passaic, Somerset, Sussex, Union and Warren.
2	748 Federal Bldg., 641 Washington St., New York 14, N. Y.	New York..... Delaware..... New Jersey..... Pennsylvania.....	Albany, Bronx, Columbia, Delaware, Dutchess, Green, Kings, Nassau, New York, Orange, Putnam, Queens, Rensselaer, Richmond, Rockland, Schenectady, Suffolk, Sullivan, Ulster and Westchester. Newcastle. Atlantic, Burlington, Camden, Cape May, Cumberland, Gloucester, Ocean, and Salem. Adams, Berks, Bucks, Carbon, Chester, Cumberland, Dauphin, Delaware, Lancaster, Lebanon, Lehigh, Monroe, Montgomery, Northampton, Perry, Philadelphia, Schuylkill, and York.
3	Room 1200, New United States Customhouse, 2d and Chestnut Sts., Philadelphia 6, Pa.	Delaware..... New Jersey..... Pennsylvania.....	Kent and Sussex. All counties. Arlington, Clark, Fairfax, Fauquier, Frederick, Loudoun, Page, Prince William, Rappahannock, Shenandoah, and Warren.
4	508 Old Town Bank Bldg., Gay St. and Falsway, Baltimore 2, Md.	Delaware..... District of Columbia..... Maryland..... Virginia.....	All except district 6. Do. All counties. Ashe, Avery, Buncombe, Burke, Caldwell, Cherokee, Clay, Cleveland, Graham, Haywood, Henderson, Jackson, McDowell, Macon, Madison, Mitchell, Polk, Rutherford, Swain, Transylvania, Watauga, and Yancey.
5	Room 402, New Post Office Bldg., Norfolk 10, Va.	North Carolina..... Virginia..... Alabama..... Georgia..... North Carolina.....	All counties. Do. All counties. Do. Do.
6	411 Federal Annex, Atlanta 3, Ga.	South Carolina..... Tennessee.....	All counties. Do.

(Continued on page 110)

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2mfd.	600v	.37	4mfd.	2500v	3.97
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8mfd.	600v	1.07	1mfd.	2500v	1.27
10mfd.	600v	1.17	25mfd.	2500v	1.47
3x1mfd.	1000v	.47	.5mfd.	2500v	1.77
25mfd.	1000v	.47	.05mfd.	3000v	1.97
1mfd.	1000v	.57	1mfd.	3000v	2.27
2mfd.	1000v	.57	25mfd.	3000v	2.67
4mfd.	1000v	.87	1mfd.	3000v	3.47
8mfd.	1000v	1.97	12mfd.	3000v	6.97
10mfd.	1000v	2.07	2mfd.	4000v	5.97
18mfd.	1000v	2.27	1mfd.	5000v	4.97
20mfd.	1000v	2.97	1mfd.	7000v	2.97
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1F24......87	805.....3.97	11F5......67
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2C26......27	810.....4.97	3Q4......57
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2C40......97	812.....2.37	5U4......47
2C44......97	813.....5.87	5Y3......37
2C46.....5.87	814.....2.67	6A7......57
2D21.....1.07	815.....2.47	6A8GT......57
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2J22......87	826......47	6A87......97
2J26......97	829B.....3.47	6B4G......97
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2J39.....18.47	838.....2.67	6F6GT......47
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2J48.....14.97	843......37	6H7......47
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2V3G......87	865......67	6L7......77
2X2......97	866A......97	6Q7GT......57
3A1P1.....2.97	866JR.....1.87	6A87GT......47
3BP1.....1.37	869B.....18.97	68C7......57
3B22......57	872A.....1.47	68F5GT......57
3B24.....1.87	873......47	68H7......57
3B26......87	876......37	68J7GT......47
3CP1.....2.67	878.....1.17	68K7GT......57
3C21.....3.97	884......97	68L7GT......47
3C22.....17.97	885......57	68N7GT......57
3C23.....2.47	902P1.....4.97	68Q7GT......57
3C30......47	905.....1.97	6V6GT......67
3C31.....1.47	923......87	6X5GT......57
3DP1.....1.47	954......17	7A8......67
3D21A.....1.47	955......37	7B7......57
3E29.....5.97	956......37	7C3......57
4B24.....2.27	957......27	7C6......67
4E27.....12.97	958......27	7F6......67
5AP4.....3.97	1611......97	7Y4......67
5BP1.....1.27	1613......57	12A8GT......57
5BP4.....2.47	1616.....1.37	12AT6......47
5CT1.....1.97	1619......27	12AU6......67
5D21.....18.97	1624......27	12B1B......57
5FP7.....1.37	1625......27	12BE6......47
5JP1.....9.97	1626......27	12J5GT......47
5JP2.....9.97	1629......27	12J7GT......47
5J29.....14.97	1630.....1.87	12Q7GT......57
5K30.....18.97	1636.....3.97	12SA7GT......57
5LP1.....13.97	1638......47	12SF7GT......57
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6AH7......77	8005.....2.47	14B6......57
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6AL5......67	8013.....1.27	25L6GT......57
6C4......27	8016.....1.37	25Z5......47
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715B.....7.97	IA7GT......57	84/62A......67
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May, 1949

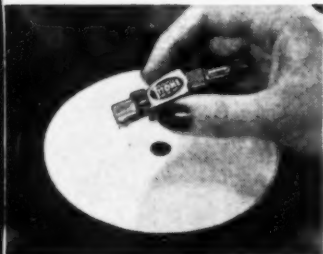
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Here's a way to quick profit from every player owner who visits your shop! Have your salesmen "plug" it on every service call! First basic pick-up advance in over 10 years—the original piezoelectric ceramic pickup, made by SONOTONE, famous makers of hearing aids and miniature tubes!

- SELLS ITSELF IN A 2-TO-5-MINUTE CALL! Fits all tone arms. Let all your customers hear TITONE. They'll say "SOLD!" because—
- TRANSCRIPTION TONE QUALITY! Full frequency to 10,000 cycles! Real high fidelity! Bell-like supertone makes even old players thrilling!
- SURE-FIRE IN HUMID CLIMATES! Utterly unaffected by climate, moisture, fungus! Booms sales, wins back customers.
- DOUBLES RECORD LIFE AND PLEASURE! Gives "ordinary" records sparkling quality—revives worn favorites. Will play down to 1/2 normal pressure. NO "needle talk"!
- RUGGED! PERMANENT! No crystals, magnets, filaments to fail! No pre-amplifiers. Ceramic TITONE performs perfectly for years!

**NO TONE LIKE
TITONE**

CALL YOUR JOBBER—
or write now to
SONOTONE, Box T-2 Elmsford, N. Y.

RADIO DISTRICTS (Continued from page 108)

Radio district	Address of the inspector in charge Federal Comm. Comm.	Territory within district	
		States, etc.	Counties
7	Post Office Box 150, 312 Federal Bldg., Miami 1, Fla. Suboffice, 409-410 Post Office Bldg., Tampa 2, Fla.	Florida.....	All except district 8.
8	400 Audubon Bldg., New Orleans 16, La.....	Alabama..... Arkansas..... Florida..... Louisiana..... Mississippi..... Texas.....	Baldwin and Mobile. All counties. Escambia. All counties. Do. City of Texarkana only.
9	404 Post Office Bldg., Galveston, Tex.....	Arkansas..... Brazoria, Brooks, Calhoun, Cameron, Chambers, Fort Bend, Galveston, Goliad, Harris, Hidalgo, Jackson, Jefferson, Jim Wells, Kenedy, Kleberg, Matagorda, Nueces, Refugio, San Patricio, Victoria, Wharton, and Willey.	All counties.
10	Post Office Box 5238, 500 U. S. Terminal Annex, Dallas 2, Tex.	New Mexico..... Oklahoma..... Texas.....	Do. All except district 9 and the city of Texarkana.
11	539 U. S. Post Office and Courthouse Bldg., Temple and Spring Sts., Los Angeles 12, Calif. Suboffice, 307 U. S. Customhouse and Courthouse Bldg., Union and "F" Sts., San Diego 1, Calif.	Arizona..... California..... Nevada.....	All counties. Imperial, Inyo, Kern, Los Angeles, Orange, Riverside, San Bernardino, San Diego, San Luis Obispo, Santa Barbara, and Ventura. Clarke.
12	328 Customhouse, San Francisco 26, Calif.....	California..... Nevada.....	All except district 11. All except Clarke.
13	805 Terminal Sales Bldg., Portland 5, Oreg.....	Idaho..... Oregon..... Washington.....	All except district 14. All counties. Wahkiakum, Cowlitz, Clark, Skamania, and Klickitat.
14	808 Federal Office Bldg., Seattle 4, Wash.....	Idaho..... Montana..... Washington.....	Benewah, Bonner, Boundary, Clearwater, Idaho, Kootenai, Latah, Lewis, Nez Perce, Shoshone.
15	504 Customhouse, Denver 2, Colo.	Colorado..... Utah..... Wyoming..... Minnesota..... Michigan.....	All counties. All except district 13. Do. Do. Do.
16	208 Uptown Post Office and Federal Courts Bldg., 5th and Washington Sts., St. Paul 2, Minn.....	North Dakota..... South Dakota..... Wisconsin..... Iowa..... Kansas..... Missouri..... Nebraska..... Illinois..... Indiana..... Iowa.....	Alger, Baraga, Chippewa, Delta, Dickinson, Gogebic, Houghton, Iron, Keweenaw, Luce, Mackinac, Marquette, Menominee, Ontonagon, and Schoolcraft. All counties. Do. All except district 18. Do. All counties. Do. Do. Do. Do.
17	809 U. S. Court House, Kansas City 6, Mo.....	Wisconsin.....	Albany, Buchanan, Cedar, Clayton, Clinton, Delaware, Des Moines, Dubuque, Fayette, Henry, Jackson, Johnson, Jones, Lee, Linn, Louisa, Muscatine, Scott, Washington, and Winnebago.
18	246 U. S. Court House, Chicago 4, Ill.....	Columbia, Crawford, Dane, Dodge, Grant, Green, Iowa, Jefferson, Kenosha, Lafayette, Milwaukee, Ozaukee, Racine, Richland, Rock, Sauk, Wa'worth, Washington, and Waukesha.	All counties. All except district 16. Do.
19	1029 New Federal Bldg., Detroit 26, Mich..... Suboffice, 541 Old Post Office Bldg., Cleveland 14, Ohio.	Kentucky..... Michigan..... Ohio..... West Virginia.....	All counties.
20	328 Federal Bldg., Buffalo 3, N. Y.	New York.....	All except district 2.
21	609 Stangenwald Bldg., Honolulu 1, Territory of Hawaii.....	Pennsylvania..... Territory of Hawaii..... Guam..... Midway..... Wake..... American Samoa..... Puerto Rico..... Virgin Islands.....	All except district 3.
22	Post Office Box 2987, 322-323 Federal Bldg., San Juan 13, Puerto Rico.	Alaska.....	
23	Post Office Box 1421, 7-8 Shattuck Bldg., Juneau, Alaska.		

others. Also, you must appear in person for the Class A test, regardless of where you live.

One of the things not generally known about the licensing procedure is that an applicant can take the test in person at any FCC office giving it, regardless of where he lives. For instance, your permanent home might be Illinois, but you are attending school in New Haven. If you should happen to be in Boston or New York or Washington during a school vacation period, you can march into the FCC offices there and take your exam. These three big offices hold "open house" Monday through Friday, from about 9 a. m. to 5 p. m. At other offices the tests are given less frequently; two or three times a week at

some, once a year at others. It pays to inquire beforehand.

And talking of paying. Never in the history of government control of radio, dating back to 1912, has there been a fee attached to the ham ticket. You do have to pay out a quarter to the notary public, but that's a private matter.

The FCC has twenty-three district offices, whose locations are given in the accompanying table. When you think you're ready for the ham test, write, phone or visit the one nearest you and ask about the license schedule. If you write, type or print your name and address clearly. Then practice the code some more, brush up on the theory, put an extra quarter in your shoe, and get going!
(To be continued)

RADIO & TELEVISION NEWS

New 1949 Diagram Manual Added to Supreme Publications



NEW MANUAL COVERS ALL POPULAR 1949 SETS

Use this new manual to repair quickly all modern 1949 radio receivers. In this big, single volume, you have clearly printed, large schematic diagrams, needed alignment data, replacement parts lists, voltage values, and information on stage gain, location of trimmers, and dial stringing for almost all recently released sets. A worthy companion to the 8 previous volumes used by over 123,000 shrewd radio servicemen. Like the previous volumes illustrated above, it sells at a give-away price and gives you a whole year of radio diagrams for a couple of dollars total cost — nothing else to buy the rest of the year, nothing else to pay. Giant size: 8½ x 11 inches. Includes complete index. Manual style binding. Available at your jobber, **\$2.50**, or send coupon, price only...

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RADIO SERVICING COURSE-BOOK



Here is your practical radio course of 22 easy-to-follow lessons. Review fundamentals, learn new servicing tricks, all about signal tracing, use of oscilloscope, recording, test equipment P.A., and T-V. Just like a \$100 correspondence course. Covers every topic of radio servicing. With self testing questions and index. Large size: 8½ x 11 in. Order by mail or see course-manual at your radio jobber, price only. **\$2.50**

New 1948 T-V Manual

New, giant volume of television factory data covers every popular make. Gives description of circuits, pages of test patterns, response curves, alignment facts, oscilloscope waveforms, voltage charts, service hints, many diagrams in the form of double-spread blueprints, test points, everything to bring you up to date and make you expert in all T-V repairs. Large, sturdy 8½"x11" manual style binding, flexible covers, price only. **\$3**

F.M. and Television Manual (1947)

Manual of instructions for trouble-shooting, repairing, and alignment of all popular 1947 F.M. and Television sets. Covers every popular make; includes AM-FM combinations, F.M. tuners, and all types of T-V receivers. This is the material you need to adjust and fix any modern F.M. and T-V set. Data on 192 large pages, 8½"x11". Sturdy, manual style binding. At your jobber or by mail; your price, only. **\$2**

Supreme Publications

Available at the Better Radio Jobbers Everywhere

May, 1949

AMAZING BARGAIN IN SERVICE DATA

Here is your low-priced, money-saving source of radio diagrams and service information for all popular sets. Above is a photograph of these giant-size manuals — available to servicemen at only \$2 for most volumes. Let these easy-to-use manuals guide you to quick fault-finding and simplified repair of any radio. Eliminate guesswork, cut hour-wasting jobs to pleasant moments. For 16 years, radiomen expected and received remarkable values in Supreme Publications service manuals. Yes, these manuals are still only \$2 each, and only \$2.50 for the new 1949 manual and the extra large 1926-38 volume. Biggest bargain in service manuals. Only a publisher who sold over a million manuals can offer such values based on tremendous volume-sales. Sold by all radio jobbers. No-risk examination granted to servicemen.



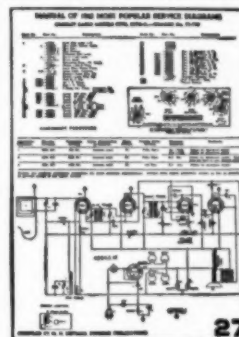
Compiled by
M.N. Beltman,
radio engineer,
teacher, author
& serviceman.

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You can speed-up and simplify radio repairs with Supreme Publications manuals. Service all radios faster, better, easier, save time and money, use these most-often-needed diagram manuals to get ahead, earn more per hour. These manuals cover every popular radio of all makes, from old timers to new 1949 sets. Clearly printed circuits, parts lists, alignment data, and helpful service hints are the facts you need to be more expert in radio servicing. Save hours each day, every day, begin to earn more by making repairs in minutes instead of hours. Let these inexpensive manuals give you needed diagrams for 80% of all sets. These manuals pay for themselves with time saved on a couple of jobs, after that you use them FREE. There are nine volumes in all as illustrated above. Each manual is 8½ x 11 inches, sturdy manual style binding, average manual has 194 pages of diagrams and practical service data. Use coupon below to order on trial.

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Giant page size is 8½"x11" inches

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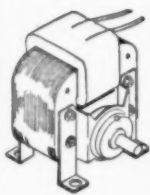
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115-volt 60-cycles
Get this motor and make the handiest tool on your workbench! Attach a flexible shaft and you're all set for grinding, sanding and buffing operations. Great for model-makers. 1/20 h.p. motor turns at 2900 RPM—does the job in half the time! 1/2" shaft, 3/4" long, 3 1/4" x 3 1/4" high; weighs only 3 1/2 lbs. May be used for many motor applications.

\$3.95

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Brand New Throat Microphone.....19c
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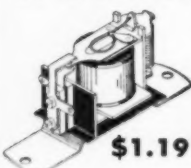
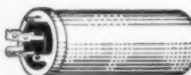


PLATE LOAD RELAY

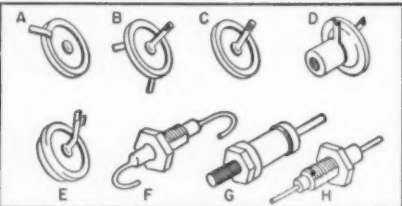
6000-ohm coil. SPST normally open contacts. Extra sensitive and used for many applications. 1 1/2" high 1 1/4" wide, on 1 1/2" mtg. ctrs.**\$1.19**
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\$7.50 per 100 (all one type)

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Used for running 110-volt AC lines, extension speakers, etc. Full 175 feet of highest quality wire with tough, weather-resistant insulation. Complete with handy drum for spooling wire for storage. **\$2.39**
Limited quantity

BRAND NEW METERS

Dejur Model 310 meter for all-around ham and test applications. 10 ma DC basic movement. 3 1/2" diameter flange; 2 1/4" body, 1 1/4" deep. Stock up on these while they last. MA-2036 each **\$1.95**



ORDER FROM THIS AD!

Send 25% deposit with order. Pay balance plus postage on delivery. Get your name on Mid-America's select mailing list and get first crack at latest, greatest values in radio parts, electronic equipment, tubes, etc. Send orders to Desk E-59. Minimum order \$2.50.

MID-AMERICA CO. Inc.

2412 S. Michigan Avenue
Chicago 16, Ill.

Grid Dip Adapter

(Continued from page 61)

od, without the use of additional equipment.

We have made reference to the probe and probe coils throughout the preceding text. The photograph of Fig. 1 shows the internal construction of this unit, component placement, and the socket mounting layer construction. The whole unit is mounted inside the small convenient tubular can. This permits measurement in the tightest places without any difficulty.

Energy Indicator

Another important application of 915 is that of a non-oscillating detector. In this case, the back plate terminals are shorted across, to provide a d.c. return for the rectifier. Under this heading may be listed the important functions of absorption-type frequency meter, field strength meter, and monitor, to mention only a few. The coupling in this case is the same as previously mentioned. The meter will read upward as we are taking energy from the specimen circuit. With an external calibration chart, it is possible to use this instrument as a db. meter for receiver or fixed line work. This, again, represents just a few of the many different applications that may be performed when using it in the de-energized condition.

Measurement of Capacitance and Inductance

The value of any capacitance, within practical limits, may be quickly determined. Model 915 is again connected to the companion signal generator, as in the dip application. To make capacitance measurements properly, it is necessary to have a good high-value, variable condenser with an associated calibration scale. This scale should indicate the actual capacitance change vs. degrees rotation. In parallel with the condenser should be an air-wound coil. Determine first the resonance of this combination circuit with the variable condenser at maximum setting. Leave 915 loosely coupled to the circuit coil and shunt the specimen condenser across the variable condenser. Retune the variable condenser until resonance is again indicated by the 915 meter. The value of the unknown condenser is the difference between the two readings on the calibrated scale. For example, if the circuit was resonant at some frequency with a maximum setting of 500 μ fd., and could be re-resonated (after the specimen had been added) at a setting of 430 μ fd., the unknown value would be 70 μ fd. A similar method may be utilized to determine, by a series additive system, the exact value of inductors. These units may be constructed if desired. The value of either type of measurement is directly related to the tolerance of the calibration scale.

SOLDER BETTER with **TRANSVISION** Soldetron

Tr. Mark Reg., Pat. Pend.

For LIGHT or HEAVY WORK
Heats Rapidly from Cold Start



- **LIGHTWEIGHT.**
- **FINGERTIP CONTROL.** No Fatigue.
- Though it weighs only 3 ozs. "Soldetron" can do the job of a 200 watt iron.
- **Ideal for precision work** in "hard-to-reach" places.
- **Interchangeable tip-heads;** no cleaning or filing.
- **Retains heat** with switch off up to 1 minute.
- **COOL GRIP** bakelite handle, cork covering. Comfortable.



Operates on 110-V. A.C., 50-60 cycles, through transformer supplied with iron, or 6-8 volt A.C. or D.C. without transformer (from an automobile battery). Price: with transformer and 1 tiphead, \$13.95; 5% higher west of Miss.; fair traded.

Ask your distributor, or write to:

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You can become a Radio and Television Technician now!

A million new jobs—almost 4,000 a week—will be created in the television industry during the next five years according to estimates of industry leaders.

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This special course prepares you for any of the following careers:
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Name Age

Address

City State

RADIO & TELEVISION NEWS

A separate associated unit is available to perform these measurements exactly. This unit is Model 917, and consists of a capacitance and inductance standard. Both standards are accurately calibrated and completely variable throughout all practical ranges.

The preceding discussion has outlined some of the application merits of a new and very unique instrument. To the engineer, technician, and production worker, it represents a quick solution to many design and testing problems. To the serviceman, it is a means of aligning and checking all receivers rapidly. The amateur reader has probably realized that his v.f.o. is the signal generator described, and may be used as a coupling source for transmitter alignment, parasitic and oscillator checking, etc. It is our opinion that once you have used an instrument of this type, you will find it indispensable. -30-

TISA PLANS CAMPAIGN

At a special meeting of the Television Installation and Service Association (TISA) of Chicago, a program was drawn up which is designed to promote the betterment of the professional serviceman.

Specific goals outlined were the establishment of adequate technical standards, installation and service rates, advanced training of personnel, owner education, and better relations with the industry.

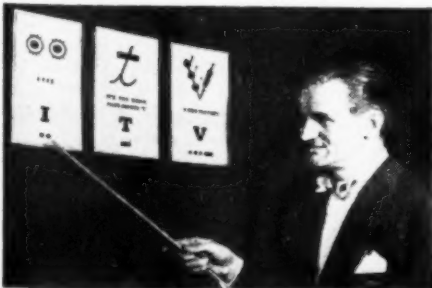
The officers of the TISA, Frank J. Moch, president; Irving Kaluzna, vice-president; Fred Levine, secretary; and Philip Bann, treasurer, hope to hear from other units regarding mutual problems. Questions should be addressed to the association offices at 3125 West 59th Street, Chicago 29, Illinois. -30-

VISUAL CODE COURSE

RECENTLY, Mr. Otto H. Luther of New Preston, Connecticut, designed a rather novel system for learning the Morse code alphabet. This method enables the student to associate the code symbols with the already familiar appearance of the letter, by means of superimposing the dots and dashes on the letters themselves in an amusing and colorful way.

For instance, the letter "I" is represented by a diagram of two bulls eyes with large red-dot centers. Under this appears the memory key word "EYES." Obviously, two dots stand for the letter "I," and you don't easily forget it.

According to Mr. Luther, a commercial artist, who sells it, this color chart system will shorten code learning time drastically, and it is not unusual for a student to master it in an hour. -30-



May, 1949

McMurdo
SILVER

IS FIRST AGAIN!



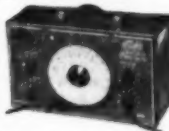
NEW! TUBELESS GRID DIP ADAPTER

THIS OUTSTANDING ELECTRONIC INVENTION brings to the engineer, serviceman and amateur a single accurate means of determining circuit function. The utility of any signal generator, test oscillator or v.f.o. is expanded many times. Allows direct measurement of all tuned circuits: r.f., i.f., etc., simply and quickly without the receiver being turned on. Checks all oscillators: antenna systems: transmitters: trap circuits: without mechanical coupling. Determines the value of all coils and condensers. Requires no power supply or tubes: two simple connections permit quick attachment to any signal generator you are using. Covers the continuous frequency range from 100 kc. through 300 mc. by use of the three calibrated plug-in coils provided. Equipped with a phone jack for easy aural identification of oscillator frequencies. Model 915 has no equal as a field strength monitor or grid dip oscillator. Handsomely styled, complete with compact probe and plug-in coils, **\$34.95^{NET}**

MODEL 906 FM-AM SIGNAL GENERATOR This advanced type signal generator stands out as today's greatest electronic value. Continuous coverage from 90 kc. through 210 mc. Accuracy $\pm 1\%$. Less than $\frac{1}{2}$ microvolt including strays to over 1 volt metered output. AM modulation adjustable from 0-100%. FM sweep from 0-1200 kc. Complete with all accessories **\$116.50** at a low net price of only



MODEL 911 TV-FM SWEEP GENERATOR Here is an all-in-one TV service center. Continuous range of 2 thru 226 mc. Output from 0- $\frac{1}{2}$ volt. 1 and 5 mc. precision crystal markers insure pin-point setting of TV i.f. band width, and trap circuits. Phased 60 cycle sine and 120 cycle saw-tooth voltages for direct scope control. Sweep from 0-10 mc. An outstanding buy at only **\$78.50**



Look to McMurdo SILVER for the NEWEST in FM-TV Service Equipment
SEE US AT BOOTH 41 AT THE CHICAGO SHOW

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See these and other McMurdo Silver (CET) instruments at your favorite jobber.

OVER 37 YEARS OF RADIO ENGINEERING ACHIEVEMENT

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WHOLESALE RADIO
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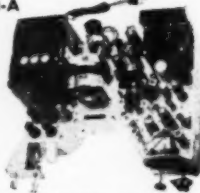
NEW LOW PRICED T.V. KIT

Philmore Model U-30-A

Circuit Design of
 R.C.A. 630 T.S.

Now only
\$159

Less picture tube
 and cabinet



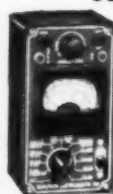
With Philmore's Famous Step-by-Step Instructions
 Complete with 29 tubes and all mounting hardware.
 Factory pre-wired and aligned front end. All sockets
 are assembled to chassis.
 Cabinet for R.C.A. 630 T.S. \$33.75

UNBEATABLE METER BUY!

An Accurate Pocket Size

VOLT OHM MILLIAMMETER

SUPERIOR Model 770



(Sensitivity—1000 ohms per volt)
 Complete with self-
 contained batteries,
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6 A.C. VOLTAGE RANGES:
 0-15/30/150/300/1500/3000 Volts
 6 D.C. VOLTAGE RANGES:
 0-7.5/15/75/150/750/1500 Volts
 4 D.C. CURRENT RANGES:
 0-1.5/15/150 ma. 0-1.5 amps.
 2 RESISTANCE RANGES:
 0-500 ohms 0-1 megohm

COMPACT
 Measures 3 1/2" x 5 7/8" x 2 1/4"

G.E. GERMANIUM DIODE IN48

- Welded Contact • Self Healing
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Eliminates hum. 10,000 hrs. average life. Shown in actual size. Write today for complete specifications. **\$1.35**

JFD Super Beam, All Channel



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ANTENNA

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\$8.10
 each
 In lots
 of six
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Matches input of nearly all T.V. sets. Unidirectional pattern over both bands eliminates "ghosts" caused by multipath signals. Complete with 5 ft. mast and mounting bracket less lead-in. Order model TA150.

STACKING BARS, set of 2 . . . 98c

300 OHM TWIN LEAD
 \$1.95—100 ft. \$13.75—1000 ft.

ALLIANCE "Tenna-Rotor"

A perfect rotator for Television or Amateur Antenna. Order model ATR.

List **\$39.95** With Remote Control Box
 Flat, rubber covered, 4 conductor connecting cable for Alliance motor. net 4c per ft.

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10 MFD **95c**
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Manufacturers' Literature

Readers are asked to write directly to the manufacturer for the literature. By mentioning RADIO & TELEVISION NEWS, the issue and page, and enclosing the proper amount, when indicated, delay will be prevented.

CONVERTER CATALOGUE

The complete line of *Carter* converters is presented in a new catalogue which is designed to furnish complete information in great detail to those who buy, sell, use, or service the company's products. The literature is presented in a convenient form, best suited to the needs of engineering and purchasing departments.

The bulletin consists of 16 illustrated pages on the entire range of available input and output voltages, including the recently perfected designs to be used in conjunction with television operations, as well as those for recording, sound projection, and mobile communications applications.

Also included is a *Carter* Selector Chart, augmented to include new television and recording equipment for which these converters are adapted. The chart shows at a glance the correct converter required to operate each popular make and model. A complete list of sales representatives is also supplied, and a convenient index is included.

Inquiries for the "Converter Catalog No. 349" should be addressed to *Carter Motor Company*, 2644 N. Maplewood Avenue, Chicago, Illinois.

TV ANTENNA BOOKLET

An eight-page catalogue recently put out by the *Workshop Associates, Inc.*, 66 Needham Street, Newton Highlands 61, Mass., amply illustrates the company's line of television antennas, mounts, etc.

Sections are devoted to the *Workshop* high-gain antennas, masts, and mounts, as well as high-gain arrays, transmission line, connectors, transformers, and typical antenna arrangements. Complete specifications are given for the products, together with prices. Television reception problems are covered, and the suggestions should be welcomed by the servicemen who must experience them.

This catalogue, Number 49, is obtainable free of charge by writing to the *Workshop Associates, Inc.*, in Massachusetts.

STANDARD TERMINOLOGY

Recent scientific developments in ultrasonics, recordings, underwater sound, acoustical instruments, and shock and vibrations are reflected in the Proposed American Standard Acoustical Terminology, being published for a period of trial study before its final approval. The American Standards Association has made every effort to keep the definitions consistent with those in standards relating to neighboring fields, and each term is as completely defined as possible.

The committee working on the terminology took into consideration such recent developments as the widespread use of the term "supersonic" for speeds higher than the velocity of sound following its use in this sense during the war. As a result, the term "ultrasonic" has been defined as indicating sounds having frequencies beyond the upper pitch limit. Studies of underwater sound phenomena also showed the need for a broader definition of "reverberation" as the types of reflections from boundaries under water differ from those received in a room.

Workers in theoretical and applied acoustics and all others interested are invited to send comments on the proposed terms to the committee in charge not later than September 30, 1949. Address Messrs. E. Dietze or C. F. Wiesbusch, *Bell Telephone Laboratories, Inc.*, Murray Hill, N. Jersey. Copies of the standard, Z24A, can be obtained from the American Standards Association, 70 East 45th Street, New York 17, N. Y., at \$1.00 each.

BROADCAST MICROPHONES

Electro-Voice, Inc., Buchanan, Michigan, has developed two new ultra-wide-range, high-fidelity microphones (Models 645 and 650) designed for the FM and AM broadcast services and has released a new bulletin, Number 144, giving all necessary data on these models.

The bulletin explains the various performance and construction features, with detailed specifications, and is illustrated with photographs and sketches.

A copy may be obtained by writing to the company at Buchanan, Michigan.

SOLDERING TECHNIQUES

The 28-page technical manual entitled "Solder and Soldering Technique," published by the *Kester Solder Company*, contains an analysis of the properties and application of soft solder alloys and soldering fluxes.

Contents include the general nature of soldering, its application, the melting points and properties of solder and solder alloys, and information on how to utilize the company's technical and industrial service.

Write the *Kester Solder Company*, Technical Department, 4201 Wrightwood Avenue, Chicago 39, Illinois, for free copies of this manual.

GAUGE HANDBOOK

A combination catalogue, price list, textbook, and reference manual has been announced by *The Sheffield Corporation* of Dayton 1, Ohio. It is an

RADIO & TELEVISION NEWS



HALLICRAFTERS TV
Model 509

The latest addition to the Hallicrafters TV line. Push button tuning on all 12 channels. Dual Focus for larger round pictures with 56 sq. in. rectangular picture or 64 sq. in. full circle picture for dramatic close ups—all at a flick of a front panel switch. Mahogany veneer cabinet. Transparent safety shield. 19 tubes plus 3 rectifiers.
\$269⁵⁰
Complete with ALL TUBES. Shpg. Wt. 105 lbs.

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MADE POSSIBLE BY "SURPRISE" TRADE-IN ALLOWANCES ON YOUR USED TEST AND COMMUNICATION EQUIPMENT

Right on the eve of an exciting new season of summer sports events, Walter Ashe makes it possible for you to own Hallicrafters TV equipment at tremendous savings! So don't delay. Get your trade-in deal working today. Phone, wire, write or use the handy coupon.

Model T-64 Chassis unit only of Model 509. Completely wired and tested, but less picture tube. Only

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☐ Rush bigger-than-ever "Surprise" trade-in allowance on my _____ (describe used equipment) for Hallicrafters TV

(show model of new equipment desired)

☐ Mail me my copy of latest Hallicrafters Catalog.

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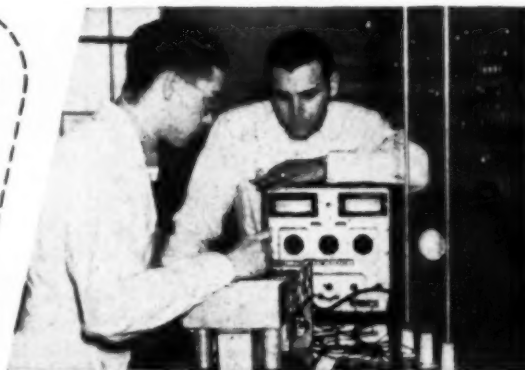
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Don't confuse the RADIO-ELECTRONICS course offered by SPARTAN with other courses, offered anywhere! As a graduate from this famous school you will know the application to industrial control devices; to the search for petroleum; and the important uses of radar, television and other electronic equipment.

SPARTAN offers two complete and thorough courses. You will work on the most modern and complete equipment. You will build equipment. You may join the SPARTAN "Ham" Club. Either course prepares you for Federal Communication Commission license tests—first class radio telephone, second class radio telegraph, or class "B" radio amateur.



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May, 1949

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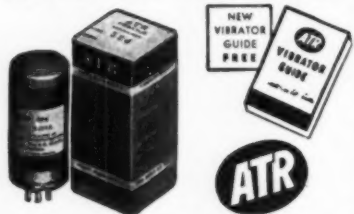
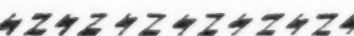
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SAINT PAUL, MINNESOTA - U.S.A.

illustrated bulletin of factual information for the buyers and users of precision gauges and includes prices, complete specifications, diagrams, and tables.

This 116-page catalogue is among the first to present information and prices on gauges conforming to the new, unified screw thread system recently agreed upon by the English speaking countries using the inch as a standard of measurement.

Sheffield representatives throughout the United States and Canada have been given a supply to distribute to their customers, and copies may be had free of charge by any user of gauges by writing to *The Sheffield Corporation*, Dayton 1, Ohio, on business stationery.

BI-MONTHLY "TECHNI-TALK"

The Tube Division of the *General Electric Company* has announced a new magazine called "Techni-Talk," which is designed to keep servicemen and dealers abreast of the latest developments in radio and television and to assist them with technical problems encountered in the field.

This bi-monthly illustrated publication features in the first issue (February-March) the beginning of a group of articles on the installation and servicing of television receivers. This issue also carried an article on the volt-ohm-milliammeter, the first of a series to help the serviceman get the most out of a minimum of test equipment.

"Techni-Talk" is distributed to the dealer or serviceman without cost but is obtainable only through *General Electric* or *Ken-Rad* distributors and not direct from the company.

PRINTED CIRCUITS

"Here is the Story," a booklet issued by *Microcircuits Company*, describes briefly their printed circuits and lists a number of branches of electronics in which these have been utilized.

The catalogue also illustrates the *Microcircuits Company* line of conducting, resistance, and magnetic paints, and the uses to which the paints may be put by repairmen, amateurs, engineers, designers, teachers, operators, and students. Also given are the order numbers, current prices, and pertinent technical data on each product.

The bulletin may be obtained without charge by writing to *Microcircuits Company*, New Buffalo, Michigan.

SERVICING YEARBOOK

Philco Corporation has published a yearbook containing servicing information on its 1946 and 1947 home radios and radio phonographs. This book, available to dealers and independent servicemen, provides in one volume information previously contained in separate radio manuals, together with many additions.

The yearbook explains the *Philco* trouble-shooting procedure, showing alignment procedures, base views, schematic diagrams, circuit descrip-

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Now You Can Have Approximately

200 LBS. OF COSTLY RADIO PARTS

Special Gov't Surplus Ass'tm't **\$25.00**
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SEND ONLY \$5 DEPOSIT!

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An excellent value for the amateur experimenter. This is the unit which is sent into the sky by balloon and automatically transmits back information as to the changing temperature, humidity, barometric pressure, etc.

Consists of the following:

- 1—Miniature Battery Transmitter complete with a 3A5 tube.
- 1—Miniature sensitive relay-SPDT. 100 ohm coil operates from 3 Volt battery.
- 1—Temperature sensitive resistance element.
- 1—Humidity sensitive strip.
- 1—Barometer coupled to a selector switch.
- 1—Pressure, temperature, humidity chart.

The entire unit is encased in the original packing and is brand new.

While they last—only **\$4.95**

Television Transformer. Pri. 115 Volts 60 Cycles. Sec. 2500 Volts @ 2 ma. 6.3 Volts @ .6A. 2.5 Volts @ 1.75A. **PRICE \$3.85**

Magnet Wire on small spools 1/4-1/2 lb. in sizes No. 22 through No. 44 **Price per spool 25c**

Radio Noise Filter

Model NFRD—If it doesn't work, send it back!!

We absolutely guarantee that our Model NFRD will eliminate all line noises when properly connected to radios, television sets, short wave sets, motors, electric shavers, refrigerators, vibrators, oil burners, transmitters, and all other sources of interference. This unit will carry up to 12 amperes or 1 1/4 KW of power and may be used right at the source of interference or at the radio. Small size only 3" x 1 1/4" x 7 1/4". Very low price only. **each \$1.95**

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154 Greenwich Street New York 6, N. Y.

RADIO & TELEVISION NEWS

tions, drive-cord drawings, and other servicing helps on the home radios, combinations, and portables. Conveniently indexed for handy quick reference, it is priced at \$2.75.

Also released is another handbook containing complete service and replacement parts information for the Philco Universal model auto radios and custombuilt models for Studebaker, Chrysler, and Packard. The price of this manual is \$1.50. Address Philco Corporation, Tioga and "C" Streets, Philadelphia 34, Pa.

NEW RELAY BULLETIN

The fifteen basic models of general purpose appliance, motor-starting, and telephone-type relays manufactured by the Potter & Brumfield Sales Co. are illustrated and described in their 1949 catalogue Number 149. From these 15 basic models, approximately 7,000 different specifications have been developed for the electronic industry.

The company announces that the booklet will be sent free of charge to firms requesting it on company letterhead. Address the Potter & Brumfield Sales Co., 549 West Washington Boulevard, Chicago 6, Ill.

AUTO SPEAKER DATA

The Permoflux Corporation, 4900 West Grand Ave., Chicago, Ill., announces that its new chart, No. J-28, is available to those who write to them requesting a copy.

This company, one of the pioneer manufacturers of permanent magnet dynamic transducers, has accumulated a good deal of information on replacement speakers for practically all auto radio sets now in existence, and incorporated it into this chart. Any serviceman should find it helpful. Ask for Auto Speaker Chart, No. J-28. -50-

SPEED-UP OF BELL TV NETWORK

ADDITIONAL channels on the Bell System's television network between Philadelphia and Chicago will be available more than a month ahead of schedule, according to an announcement of the American Telephone & Telegraph Company.

Under this program, the present pair of circuits (which transmits television programs in opposite directions) will be supplemented by the three west-bound and one east-bound channels being made available. After the installation, scheduled for around the first of May, two of the west-bound channels will operate on a twenty-four-hour schedule, while the third will be available only after 6:00 p.m.

Between Monday and Friday, the single east-bound channel will be available only after 6:00 p.m. This circuit, however, will be placed in operation for television transmission at any time on Saturdays and Sundays, making it possible to bring week-end Midwest sports events to the East.

Occasional important television programs will also be accepted, on advance notice, for transmission southward between New York and Boston. These, in recent months, have been arranged to carry only north-bound programs. -50-

SELENIUM RECTIFIERS AND SPECIALIZED ELECTRONIC COMPONENTS



VACUUM CAPACITORS

Standard Brands

12 Mmfd	20 Kv.	\$4.95
50 Mmfd	20 Kv.	4.95
50 Mmfd	32 Kv.	5.95

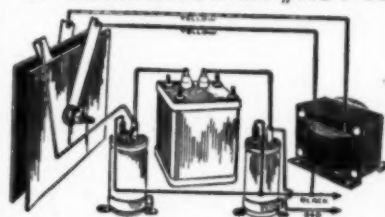
SILVER CERAMIC TRIMMERS

Type		
820-Z	5-20 Mmfd Zero Temp.	24c
822-N	5-20 Mmfd Neg. 300	24c
822-AZ	4.5-25 Mmfd Zero Temp.	24c
823-AN	20-125 Mmfd Neg. 650	33c

FENWAL THERMOSWITCH

Normally closed. Opens with temp. rise. Adjustable from -40° to +400° f each \$1.25

"A" ELIMINATOR KIT #KC 1-10



A well-engineered 6 Volt D. C. power unit; for auto-radio and similar service work. Previously in the high-priced range. Now, in kit form, with all essential components to easily construct, and at a low, low price. This kit is designed to operate from a 115 A.C. 50/60 cycle source, and delivers 6 V. D.C., well filtered at eight amperes, with a peak rating of ten amperes. Complete with simplified instructions. \$19.95

FULL WAVE BRIDGE TYPES

Input	Output	
0-18VAC	0-13VDC	
Type #	Current	Price
B1-250	250 MA.	\$ 98
B1-500	500 MA.	1.95
B1-1	1 AMP.	2.49
B1-1X5	1.5 AMP.	2.95
B1-5X5	3.5 AMP.	3.95
B1-5	5 AMP.	5.95
B1-10	10 AMP.	9.95
B1-15	15 AMP.	13.95
B1-20	20 AMP.	15.95
B1-30	30 AMP.	24.95
B1-40	40 AMP.	27.95
B1-50	50 AMP.	32.95
B1-60	60 AMP.	36.95

FULL WAVE BRIDGE TYPES

Input	Output	
0-54VAC	0-40VDC	
Type #	Current	Price
B3-150	150 MA.	\$1.25
B3-250	250 MA.	1.95
B3-600	600 MA.	3.25
B3-5	5 AMP.	13.95
B3-10	10 AMP.	24.95
Input	Output	
0-72VAC	0-54VDC	
Type #	Current	Price
B4-600	600 MA.	\$3.95
B4-5	5 AMP.	14.95
B4-10	10 AMP.	17.95
B4-10	10 AMP.	32.95

FULL WAVE BRIDGE TYPES

Input	Output	
0-36VAC	0-26VDC	
Type #	Current	Price
B2-150	150 MA.	\$.95
B2-220	220 MA.	1.25
B2-300	300 MA.	1.50
B2-450	450 MA.	1.95
B2-600	600 MA.	2.95
B2-1	1 AMP.	3.95
B2-2	2 AMP.	4.95
B2-3	3 AMP.	6.95
B2-5	5 AMP.	9.95
B2-10	10 AMP.	15.95
B2-20	20 AMP.	27.95
B2-30	30 AMP.	36.95

THREE PHASE BRIDGE TYPES

Input	Output	
0-12VAC	0-13VDC	
Type #	Current	Price
3B7-4	4 AMP.	\$32.95
3B7-6	6 AMP.	45.95
3B7-15	15 AMP.	79.95
Input	Output	
0-234VAC	0-250VDC	
Type #	Current	Price
3B13-4	4 AMP.	\$56.00
3B13-6	6 AMP.	81.50
3B13-15	15 AMP.	120.00

FULL WAVE BRIDGE TYPES

Input	Output	
0-115VAC	0-110VDC	
Type #	Current	Price
B6-150	150 MA.	\$1.95
B6-250	250 MA.	2.95
B6-3	3 AMP.	18.95
B6-5	5 AMP.	24.95
B6-10	10 AMP.	36.95

FULL WAVE BRIDGE TYPES

Input	Output	
0-234VAC	0-180VDC	
Type #	Current	Price
B13-5	5 AMP.	\$54.95
B13-10	10 AMP.	69.95

CENTER TAPPED TYPES

Input	Output	
12-0-12VAC	0-8VDC	
Type #	Current	Price
C1-10	10 AMP.	\$7.95
C1-20	20 AMP.	12.95
C1-30	30 AMP.	17.95
C1-40	40 AMP.	21.95
C1-50	50 AMP.	25.95
C1-80	80 AMP.	34.95
C1-120	120 AMP.	46.95

*Select Proper Capacitor From List Shown Below, to Obtain Higher D.C. Voltages Than Indicated

RECTIFIER MOUNTING BRACKETS

For Types B1 through B6, and Type C1	.35 per set
For Types B13	.80 per set
For Types 3B	1.20 per set

RECTIFIER TRANSFORMERS

Type #	Volts	Amps.	Price
XF15-12	15	12	\$3.95
TXF36-2	36	2	3.95
TXF36-5	36	5	4.95
TXF36-10	36	10	7.95
TXF36-15	36	15	11.95
TXF36-20	36	20	17.95

All TXF Types are Tapped to Deliver 32, 34, 36 Volts.

RECTIFIER CHOKES

Type #	Amps.	Price
HY2	.03 Hy	\$ 2.25
HY3	.03 Hy	3 2.95
HY5	.02 Hy	5 3.25
HY8X5	.02 Hy	8.5 7.95
HY10	.02 Hy	10 9.95
HY12	.02 Hy	12 12.95
HY15	.015 Hy	15 13.95

RECTIFIER CAPACITORS

CF-13	5000 MFD	10VDC	\$2.49
CF-14	3000 MFD	12VDC	1.69
CF-15	6000 MFD	12VDC	2.95
CF-1	1000 MFD	15VDC	.98
CF-2	2000 MFD	15VDC	1.69
CF-3	1000 MFD	25VDC	1.69
CF-4	2X3500 MFD	25VDC	3.45
CF-5	1500 MFD	30VDC	2.49
CF-6	4000 MFD	30VDC	3.25
CF-7	3000 MFD	35VDC	3.25
CF-8	100 MFD	50VDC	.98
CF-9	500 MFD	50VDC	1.95
CF-10	2000 MFD	50VDC	3.25
CF-11	200 MFD	150VDC	1.69
CF-12	100 MFD	350VDC	2.25
CF-12	125 MFD	350VDC	2.49

VARIABLE AIR TRIMMERS

Standard Brands—Screw Driver Adj.

	Lots of 10	Lots of 100
7.5 MMF	\$2.90	\$27.00
25 MMF	3.10	29.00
50 MMF	3.30	31.00
100 MMF	4.10	39.00
140 MMF	4.90	47.00

METERS

0-15 MA.D.C. Weston #506 2" Rd.	\$2.95
0-60 A.D.C. West. w./shunt, 2 1/4" Rd., aircraft type	3.25
0-120 A.D.C. West. w./shunt, 2 1/4" Rd., aircraft type	4.95
0-30 V.D.C. West. 2 1/4" Rd., aircraft type	2.95
0-300 V.D.C. 2 1/4" Rd. Bakelite Case	2.95

To avoid shipping errors, kindly order by type #. All prices subject to change without notice.

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Our engineering staff is at your service to facilitate the application of rectifiers to your specific requirements.

Write for quantity discounts on company letterhead.

Minimum order \$3.00. No C.O.D.'s under \$25.00. 25% deposit on C.O.D. Add 10% for Prepaid Parcel Post and Handling. Terms: Net 10 days to rated concerns only

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Hot Radio Values At Sun Radio

2-6 MC PB RECEIVERS

6 Tubes (3—1T4, 1—1R5, 1—1S5, 1—354) 2-6 MC in 4 bands. Sold as pictured including 4" speaker and Schematic. Easily converted to broadcast with instructions furnished. Has RF Stage and audio output stage to dual speaker. Used but guaranteed operative.

\$9.95



GRAB BAG...only \$7.95

\$50 Value Over 8 lbs. The greatest value your dollar ever bought. Resistors, Condensers, Sockets, Ballast Tubes, Rheostats, Pots, Knobs Transformers.

POWER TRANS.—650V-CT-70MA, 6.3V-3A, 5V-2A, Also 115V Isolation winding on secondary. PRI—115V-60CY **\$ 1.25**

POWER TRANS.—745 VCT—145 MA, 5V-3A, 6.3V-5A—PRI-115V-60CY... **4.95**

Base for Record Changer—with 3 tube AMP & 5" SPKR, mounted... **7.95**

BASE ONLY—Lees AMP & SPKR... **2.95**

WESTON—2-Range D.C. Milliammeter —0-150—1500 MA Laboratory Standard—with Leather carrying case Brand New—Value... **\$125.00 ONLY 24.95**

COILS—3-circuit with Vario coupler—BC Band... **0.75**

OSCILLOSCOPE—2 inch—Waterman —Reg. \$66.50... **ONLY 44.50**

TWEETER—Atlas HF-1—In Cabinet with Crossover Network. Reg. List Price \$100.00... **ONLY 39.95**

12GP7—Cathode Ray Tube—Electrostatic... **14.00**

REINER—451 Laboratory VTVM. Reg. \$150.00... **ONLY 100.00**

VO-M-GE-Unimeter UM3—2000 OHMS per volt. Reg. \$28.50... **ONLY 19.95**

VO-M-GE-Unimeter YMW—1A—20,000 per volt. Reg. \$39.50... **ONLY 29.50**

AUDIO OSCILLATOR—YG-A. 4-Reg. \$49.50... **ONLY 29.50**

WESTERN ELECTRIC—3B24A Tubes **1.95**

TRANSCRIPTION TURNTABLE—16"—Dual Speed Famous make. Reg. \$125.00... **ONLY 99.50**

TRANSCRIPTION ARM R.M.C.—16" Broadcast Type—Magnetic with Equalizer. Reg. Price \$136.50... **ONLY 99.50**

GE-YYWI—HI-voltage multiplier for 20,000 OHM per volt meters to 10 KV... **9.95**

JACKSON—multimeter No. 642—20,000 OHMS per volt. Reg. \$59.95... **ONLY 39.95**

GONSET—20 meter converter. Reg. \$39.95... **ONLY 29.95**

GONSET 6 meter converter. Reg. \$39.95... **ONLY 29.95**

TERMS All items F.O.B., Washington, D. C. All orders \$30.00 or less, cash with order. Above \$30.00, 25 per cent with order, balance C. O. D. Foreign orders cash with orders, plus exchange rate.

SUN RADIO
OF WASHINGTON, D. C.
938 F STREET, N. W. WASH 4 D C

Frequency Meter—V.F.O. (Continued from page 57)

the band perfectly, but when another condenser, also marked 20 μ fd., was substituted it was necessary to parallel it with a condenser marked 10 μ fd. to bring the band where it was desired. It is suggested that for C_3 , three CRL CC20Z condensers in values of 2 μ fd., 5 μ fd., 10 μ fd. and one CRL CC25Z 20 μ fd. condenser be purchased and by cut and try methods, using the condensers in parallel, adjust the band exactly where it is desired. Of course, if a 15 or 25 μ fd. variable air trimmer condenser is used, the band can be centered after the unit is assembled. The disadvantage in the use of a trimmer adjustable from the outside is that there is always the possibility that it may be inadvertently changed.

The chassis is aluminum, 10" x 6" x 2", with welded corners, and a shallow tray also with welded corners and $\frac{1}{2}$ " deep was made in which the chassis just fits. This provides complete shielding. The tray is fastened to the chassis with six 6/32 screws, the chassis being threaded to receive them. Four rubber feet fastened to the bottom of the tray assist in eliminating vibration and possible scratching of your desk top.

Two holes are drilled in the removable bottom of the ECO box, both $\frac{1}{4}$ " in diameter. The r.f. output lead from the ECO passes through one hole in which a Millen feed-through has been inserted. The positive high voltage lead and the hot filament lead go through the other hole. A rubber grommet is inserted in the matching hole in the chassis top through which these voltage leads pass. The four screw holes in the box are tapped to take 8/32 bolts. The box is then assembled on the chassis by inverting it and securing with 8/32 bolts passed upward through the chassis and the

box top as shown in Fig. 2. The rubber grommets provide additional shock mounting.

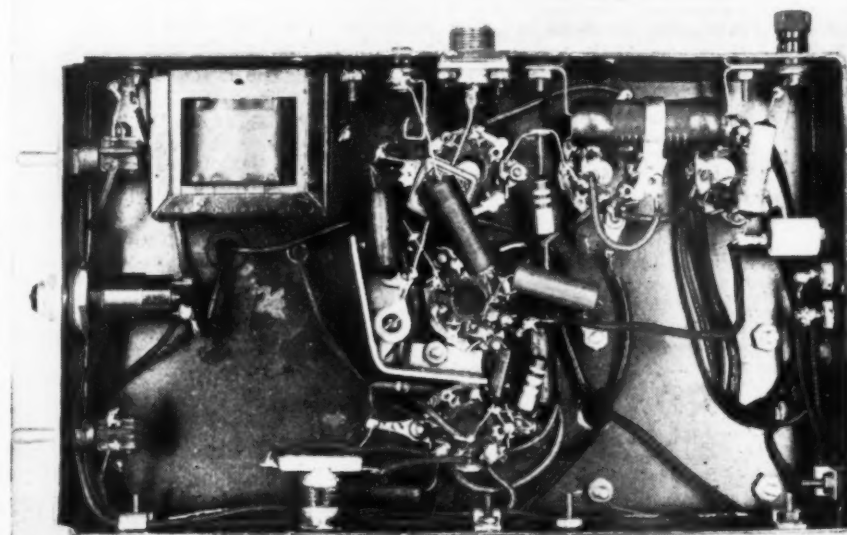
All wiring in the ECO box is made self-supporting and extremely rigid. Ceramic pillar stand-offs $\frac{1}{4}$ " high are used to support the r.f. output and high voltage leads. Every nut in the entire unit has been lock-washed. This all adds up to increased stability. Under the chassis a small piece of aluminum was bent and placed as a shield between the 6F6 isolation stage and the 6L7 mixer tube as shown in the photographs. It was found better to use grid 3 (terminal 5) of the 6L7 to receive the output from the 6F6 isolation stage, and use grid 1 (cap) for r.f. input, than to reverse these grids.

As originally mentioned, this unit may be used both for transmitter frequency control and as an accurate heterodyne frequency meter for use with either your transmitter or your receiver. With a short pickup wire attached to the binding post and either headphones or a small PM speaker plugged into the phone jack it makes an excellent monitor for keying or note checking. It also functions as a monitor for your phone transmitter as due to the large band spread, zero-beating the carrier poses no problem.

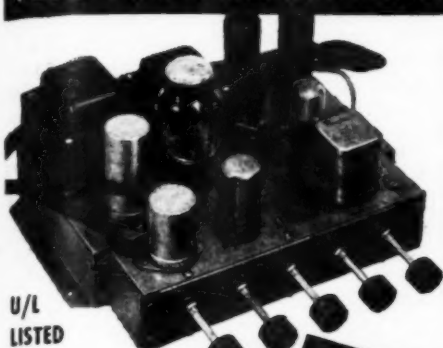
At W1RBK, the transmitter with which this unit is used as a v.f.o. normally uses a 6L6 crystal oscillator in the usual series fed tetrode circuit. A coaxial terminal is connected in parallel with the crystal socket and a length of RG12/U connects the two units together when v.f.o. rather than crystal operation is desired. Obviously it is necessary to remove the crystal when using v.f.o., and to detach the RG12/U cable when using crystal control.

Some amateurs may have built up a Don Mix v.f.o. and later replaced it with a commercial model. In that case, the v.f.o. may be easily modified for use as a heterodyne frequency meter and thus retain its utility in the ham shack.

Under-chassis view of home-built, dual-purpose frequency meter—v.f.o.



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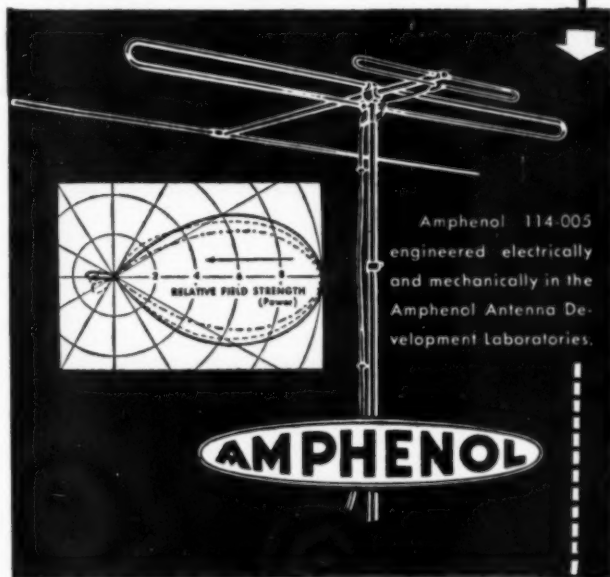
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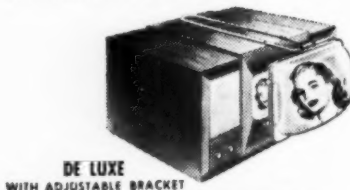
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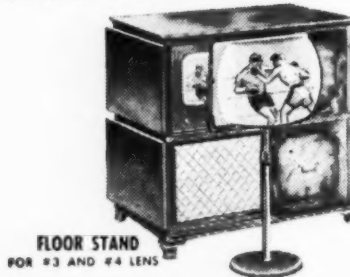
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Briefcase Portable (Continued from page 55)

Figs. 1 and 2 show the panel and chassis layouts respectively. The 140 μ fd. oscillator tuning condenser, C_{10} , is mounted on the front panel just to the right of the aluminum shield. Directly behind C_{10} is the 1.5 volt flash-light cell supported in a spring clip which affords easy replacement of the "A" source without removing the case. The antenna loading condenser, C_{11} , hidden in the top view by C_{10} (Fig. 2), can be seen mounted on the front panel in Fig. 1. Referring again to Fig. 2, the auxiliary antenna feedthrough insulator is just to the right of C_{10} . Directly behind the feedthrough is the oscillator tube followed by the oscillator final tank coil. The two XX30 45 volt "B" batteries, which neatly fill the remaining chassis space, are bolted in place by an aluminum strap.

Referring to the bottom view, Fig. 3, along the front panel from left to right are the microphone jack, J_1 , S_1 which switches the microphone into the grid circuit of the 1T4, and the d.p.d.t. switch S_{2a} , S_{2b} . S_{2a} changes the "A" battery from the receiver to the transmitter while S_{2b} is the antenna changeover switch. Next in line is the headphone jack J_2 , the "B" negative switch S_2 , and the crystal socket.

RFC₁ is located just back of the microphone jack and S_1 . To the right of the 1T4 socket, CH_1 , the impedance choke, is mounted by the same screws which hold the output transformer, T_1 , on top of the chassis. To the right is RFC₂ and C_{10} , the screen grid bypass condenser. Next is the final tank coil socket and directly in front is the 1S4 oscillator tube socket. Below the crystal socket is the feedback condenser, C_9 , a fixed neutralizing condenser, which was salvaged from an SCR-274 N command transmitter. The plates are squeezed together to increase the capacity to the required value. To the left of the "C" penlite cells is the blocking condenser, C_{11} . From the left to right, along the back drop of the chassis, can be seen the 8 μ fd. electrolytic, C_8 , which is the feedback bypassing condenser, mounted on the terminal strip. The 1S4 audio tube socket is directly in front of C_8 . Next is the closed-circuit meter jack, J_3 , and the key jack, J_4 . S_{2a} , S_{2b} , the modulator-c.w. changeover switch is mounted near the right hand end of the chassis. Housing the unit was solved by salvaging the cabinet shield and base plate from the BC 456 modulator unit. This housing measures 3 x 4 1/4 x 9 1/4 inches over-all. The chassis was cut from the modulator base plate.

The unit is assembled by attaching the chassis to the panel with washers and nuts on the front panel switches. The cabinet is fastened with the screws and square rivet-head nuts originally used in the salvaged unit.

Adjustment and operation is by means of the front panel controls

RADIO & TELEVISION NEWS

shown in Fig. 6 and the switch on the back of the case shown in Fig. 5.

To adjust the receiver the filaments are lighted by turning the gain control switch clockwise. The plate voltage is then switched on and the regeneration control is advanced until a hiss is heard in the headphones. If no hiss is heard, there is probably insufficient feedback from the tickler coil, L_2 . Some 1T4 tubes oscillate with difficulty and L_2 may require more turns. The oscillator tube should oscillate with approximately 30 volts on the screen grid. The receiver is set in the band by adjusting the bandset condenser, C_3 , and securing a beat note in the home receiver. Receiver tuning is then performed with the bandspread condenser, C_4 .

Adjusting the transmitter for c.w. operation is simple. Plug in the throw-out antenna and its loading coil, the meter, crystal, and key. Throw the "receive-send" changeover switch to the "send" position. With the key closed rotate the antenna tuning condenser to resonance as indicated by minimum dip on the meter. The antenna loading condenser is then turned clockwise with a screwdriver to the maximum increase in plate current. For best keying characteristics this increase, with the throw-out antenna, will be about 8 to 10 milliamperes. Check for resonance by readjusting the oscillator tuning condenser.

For phone operation, change the crystal to the desired phone frequency. Plug in the microphone and throw switch S_2 and S_3 to the "send" position. Remove the key to furnish plate voltage to the oscillator. Switch S_2 and S_3 is thrown to the "modulation" position and is left this way.

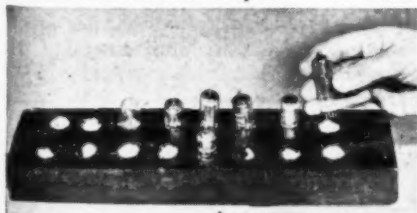
The regeneration control is fully advanced and the gain control then controls the modulation percentage. Further transmitter adjustments are the same as those described for c.w. operation.

The range of phone operation in open terrain, using the throw-out antenna, is about 5 miles, but c.w. stations hundreds of miles distant have been worked with a center-fed doublet home antenna.

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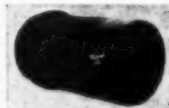


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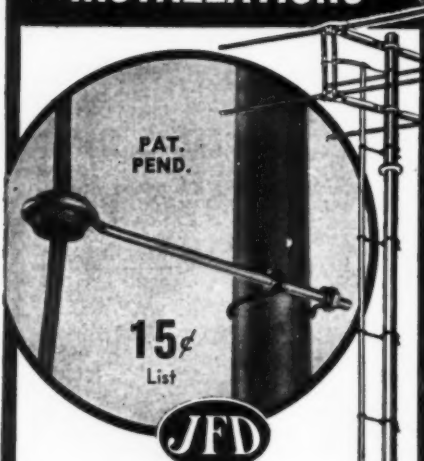
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How to Prepare Your Article for Publication

*Important rules to follow when submitting
that manuscript—the editors will like it.*

By

C. C. ERHARDT, W2HJN

HOW many of you have felt impelled to submit a write-up on your favorite brain child only to let it slide with the thought—"Aw heck, they wouldn't publish any of the messy stuff I write." Well, brother, maybe they wouldn't; but on the other hand, maybe they would if you went about it properly.

As in any other field of endeavor, there are certain rules which must be observed in order to obtain satisfactory results. It is the purpose of this article to outline those rules and to make some suggestions for the aid of the embryo writer.

The important point to consider before doing any writing is this: Is your idea of genuine interest to the radio public? Does it contain fresh, unique features? If, for example, you were considering sending in a constructional article on "How To Build A Super-Duper Receiver," it would be a good idea to look through your back issues and make sure that the reader hasn't already been deluged with super-duper receivers. However, if you feel that you have something that is really good then it's up to you to make it into first class material for publication.

For the purpose of discussion, an article may be considered as consisting of three parts: 1. Manuscript. 2. Photographs. 3. Diagrams and sketches. Let's take them in that order.

A manuscript, of course, is the text or written portion of an article. Let me emphasize one thing right now. Don't ever submit a manuscript written in longhand! Whether it means hiring a public stenographer or swiping Cousin Effie's portable, make sure that your completed manuscript is typewritten.

Don't try to write in too flowery a style. Short, simple sentences are usually best. Avoid use of overworked phrases such as "due to the fact." It's much easier to say "because." Another dilly that crops up in radio articles and makes editors pull out their hair is—"the circuit is conventional in most respects." If your circuit is conventional don't say anything. Try to avoid having too many of your paragraphs begin with the word "the." This is a habit most beginning writers fall into as it is the easiest way to open a paragraph.

Remember, you are not competing for the Pulitzer Prize. Don't worry too much about spelling or grammatical structure. If they are too atrocious the editorial staff will fix 'em up. What they are mostly interested in is the message you are trying to convey.

When typing your final version of the text be sure to use double spacing and use only one side of the paper. Paragraphs should be separated by at least three spaces. Leave wide margins all around—about two inches on top and at least an inch and a half on the other three sides. This will allow the editor sufficient room to make notations and changes directly on your copy. Number each page and put your name and address in the upper right-hand corner. When you are finished, make up a title page. This consists of a first page bearing nothing but the title of the article, your name, a one or two-sentence inkling of what the story is about, and the total number of words in the text. Don't get lazy and forget that *total*, and space the wording on the page so it is reasonably attractive. The more work you can save the editor, the more favorable his response to your article is apt to be.

Although some types of writing, such as this one, can get along very nicely without photographs, in constructional and descriptive types of articles they are very important. Photographs can make or break an article. Many an excellent piece of work has been relegated to the waste paper basket because of the poor quality of the photographs. Some types of photos, such as an outdoor shot of an antenna, can be achieved quite satisfactorily by an amateur photographer. However, for fine detail jobs, such as the underside view of a chassis, it is best to have the work done by an industrial photographer specializing in this sort of thing. They will retouch the pictures for you, masking out blemishes and highlighting fine detail with the result that you get a really excellent photograph. Do not write on the backs of photographs; use gummed labels for your captions. Your name and address should also be included.

If your article is of the type that describes apparatus or equipment of a commercial nature, don't overlook the

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Transmitter only, tubes... 5.95

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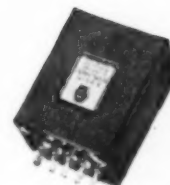
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possibility of securing your photographs from the manufacturer. Most manufacturers are glad to cooperate in this respect because of the free publicity they receive.

Liberal use should be made of diagrams and sketches if your writing requires them. Although the point you are trying to bring out might be quite clear to you, remember that the reader is not a mind reader. Anything that requires further clarification should be illustrated by photograph, sketch, or both. It is a good idea to have someone read over your manuscript to see whether everything is understandable to them. Diagrams, of course, should have all components clearly numbered, followed by a list of the parts, the "Parts List." Diagrams and sketches may be made in pencil as they will have to be redrawn by the staff artist. A transparent drawing ruler will come in very handy for this purpose. Get the kind shaped like a triangle with circular cutouts. They are swell for tube symbols, etc.

After you have gone over the completed article several times and are satisfied that it is as nearly perfect as you can make it, you are now ready to submit it for publication. Now, I bet you were going to fold up those nice typewritten sheets and put them in an ordinary envelope for mailing. Don't do it! In editorial work, everything must be kept flat. Put your sheets in a large brown envelope with stiff cardboard on both sides to prevent bending. If photographs are included, use an envelope of sufficient size to include the whole works. A couple of pieces of "Scotch" tape around the outer edges of the cardboard will hold everything intact. Gummed address stickers are very convenient to use on these envelopes. They may be obtained for a few cents at any stationery store. If you want to have your material back in the event of a reject, include a self-addressed envelope with sufficient postage.

Be sure to send everything by first class mail. Good luck to you!

Editors note: Not all publications pay for manuscripts accepted, especially those affiliated with societies or fraternal organizations. The publishers of RADIO AND TELEVISION NEWS, however, pay upon acceptance for all material of a non-publicity character at better than average rates.

-30-

PAGE FINDER

By MELVIN W. DOAN

WHEN working on a radio bench with a paper-bound book, it is always a problem to me to keep the book opened to the proper page, or read the book after the transformers, etc. which were put on the book to keep it open were in place.

I made a small flat stick, about 12x 1/2x 1/4 inches, slotted at each end. I then



inserted a stout rubber band across the stick. By slipping the book under the band the pages can be read easily. Pages can be turned by raising the rubber band slightly.

-30-

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RADIO & TELEVISION NEWS

Auto Radio Static (Continued from page 39)

Usually tire noise will be eliminated by a slight application of the brakes while driving, allowing the static electricity to pass off the wheels to the frame of the car. Wheel noise will change with the weather and road surface, being most persistent in dry weather and on hard-surfaced roads. Most wheel noise is caused from static electricity built up on the front tires by friction with the road surface and continuously discharging. The remedy is simply to provide a good ground path for the static discharge. The front wheels are not attached to the axle, but run on bearings which are greased, thereby providing an extremely poor ground at times. A coil spring inserted between the axle end and the hub cap will provide a constant ground and eliminate any discharge.

Since the rear wheels are usually well-grounded to the rear axle and drive shaft, static troubles here are infrequent. Need for noise suppressors here may be checked by disengaging the clutch while on the highway. If the noise increases, spring static grounds should be installed on the rear wheels also. While testing for tire noise, have the radio tuned between stations and the volume full on for maximum sensitivity.

Wheel noise may be further identified by kicking the car out of gear while driving and shutting off the engine. If the noise is caused by wheel static it will be heard continuously in the speaker. Antennas which mount under the car tend to pick up tire noise more easily than those which mount on the side or top of the body.

Tire noise may be further reduced by grounding the tire to the rim of the wheel by driving a round-head wood screw into the bead to make contact between the bead wire and the wheel rim. A conductive powder, now on the market, will also be found helpful in keeping down tire noise. Dust it inside the tire and on the inner tube before assembly.

Miscellaneous. On some installations it will be necessary to install condensers across the oil pressure gauge, ignition switch (at the battery terminal), starter switch, starter motor and possibly other electrical parts.

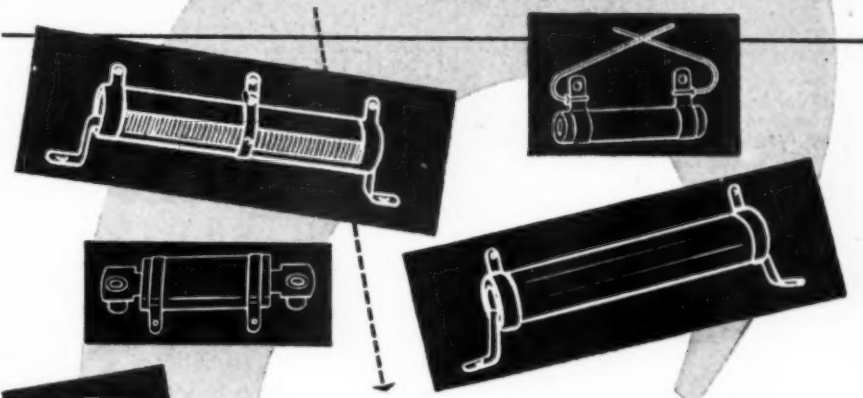
Not all of these anti-static precautions will be necessary on each individual automobile; however, it is difficult to say just what steps will be necessary in any individual case. Cars of the same year and model will often react in the same way, and a quick inspection of the radio installation in a car similar to yours may be of help in running down the source of interference.

When properly installed, a modern car radio should give as clear and noise-free reception as the set in your living-room.

-30-

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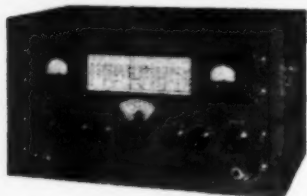
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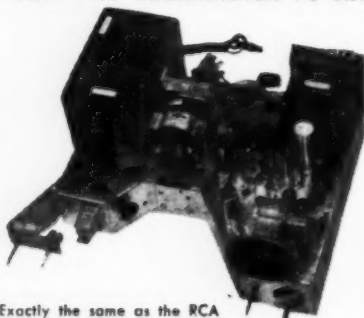
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COLLINS 32V-1 TRANSMITTER



Desk Transmitter, 150 watts cw., 120 watts phone. Band switching, gang tuning. Built-in Collins VFO covers 10, 11, 15, 20, 40 and 80 meter bands. Completely self-contained with built-in power supply. Shipping weight 133 lbs. **\$475.00**

NEW 1949 TECHMASTER TV KIT



Exactly the same as the RCA 630TS chassis, complete kit of parts, including pre-wired and aligned RCA front end, punched chassis, with all major components and sockets mounted, as shown, all RCA tubes including kine, complete manual with service notes, all RCA. New, simplified point-to-point instructions. (Free circuit and parts list on request.)
 Shpg. Wt. 85 lbs. **\$198.50**
 Kit as above but less 10BP4 tube **\$168.50**
 Shipping Weight 55 lbs.
 12-inch kine tube **69.75**
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FM TRANSLATOR General Electric Model XFM-1



Post-war version of the old G.E. J.F.M-90 Translator which was used and enjoyed by tens of thousands of discriminating radio listeners. Covers 88-108 mc range, dial 12 inches long, uses guillotine tuning for highest efficiency, high stability. Designed for export, has power inputs for 110 to 250 volts, 50/60 cy. In attractive natural walnut cabinet—10 1/4" high x 15 3/4" wide x 11 3/4" deep, complete with 8 tubes. Tropic-proof construction. Quantity limited.

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LETTERS

from our readers

BETTER TELEVISION PROMOTION!

IN regard to your article on TV promotion in the January issue of RADIO & TELEVISION NEWS, there is one important point that was not brought out, namely, the sound.

"In Los Angeles, and I believe in other parts of the country, a radio shop, or furniture store will have a very nice, expensive, well-engineered television set in the window, correctly operating; but it is behind the glass window of the store itself, so that the speaker, or speakers of the set that have been matched to the unit cannot be heard by the crowd outside. In place of the correct speaker system, they will have probably a 4, 5, or 6-inch speaker in a metal case stuck on the wall outside the window, and this in most cases is so badly mismatched, all you can hear is 'very poor audio.'

"Good audio, along with a clear picture are two of the best selling points that television has. I believe that poor audio has been one of the biggest setbacks that television promotion has to overcome. This not a gripe, but just a hint for better TV promotion."

A. N. Swiggett
897 West Vernon Avenue
Los Angeles 37, California

A good suggestion that will undoubtedly be seriously considered by many dealers.

BRITISH "CLAM UP" ON SCHEMATICS

I FEEL that I must write and let you know how much I enjoy reading my one and only copy of RADIO NEWS, dated January 1947.

"I've searched our bookstalls for other copies, but apparently I'm always too late, or just unfortunate; they're just unprocurable.

"The bold manner in which you publish the manufacturers' technical circuits simply stuns me, because our radio manufacturers are like clams with their circuits, nor have we a radio magazine anything like your RADIO NEWS.

"During the war, I had the great pleasure of working with the U. S. Signal Corps in Northern Ireland, South England, France, and Burma—a fine bunch of fellows I'll probably never meet again; they were the absolute tops on their jobs.

"Should this meet the eye of any of those fellows who spent a few months in Lisburn, N. I., teaching us their speedy and snappy methods of communication, I shall certainly be glad to hear from them. They taught the 55th Signals something, believe you me. Such pleasant memories, although the days were hard, are too difficult to for-

get. Well, here's hoping I catch up to another RADIO NEWS. More power to your elbow!"

Ernest Chadwick
(Ex/Sgt. Sig. Corps)
26 Smollett St.
Bootle, Liverpool 20, England

It is indeed gratifying to find appreciation of this sort, but it is regrettable that it must flourish in the midst of such scarcity.

NEWS FROM THE NORTH WOODS

I HAVE just received the February issue of your magazine and enjoy it very much. Each issue is looked forward to with so much enthusiasm that it has become an event of importance each month.

"It is in regard to the contest for amateur radio you are sponsoring that I am writing this letter. This contest is open only to licensed hams who already have the necessary equipment, and who, for the most part, are residing in thickly populated areas. The publishers, unfortunately, like all others who are promoting amateur radio, have given no thought to the large numbers of would-be amateurs who, like myself, live in the remote and unsettled wilds of our North American continent.

"Do you not agree that the furtherance of amateur radio would be serving at its best in these remote districts and thereby provide a complete unbroken link in the country, rather than continue to have them congregate in groups in the larger centers?

"There are numerous draw-backs to the prospective amateur in places like mine (there are thousands of them). The main one is a lack of electrical power. Battery power is, for the most part, out of the question, due to the need for recharging, and the long distances to the nearest facilities for this. The expense of lighting plants and radio equipment is another. It is not easy to purchase any article when every penny must be seriously accounted for.

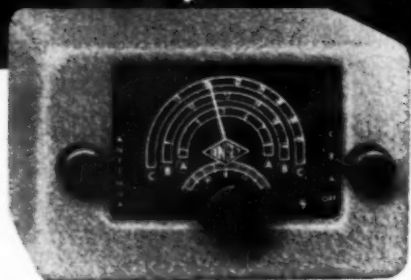
"I do not want you to take this letter as criticism, as it is intended merely to bring to your attention a class of people who are always barred by circumstances from most events of importance.

"I am very interested in radio and have been planning an amateur station in this district for some time now, but am held back by the same circumstances listed above.

"The town of Quesnel, where I live, is located in the northern part of British Columbia and is now gripped in the middle of a severe winter. I live

RADIO & TELEVISION NEWS

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in your car!*



GONSET "3-30" CONVERTER

attaches to your automobile radio
continuous coverage, 3 to 30 mc.
four working (r. f.) tubes.

extremely compact.
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Advanced
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**TEE VEE
SCOPE**
Model TV-90

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Combines the two essential instruments needed in television testing—alignment—service. A complete oscilloscope and a complete sweep generator that can be used independently. Tee Vee 90 combines two units for compactness and portability—meticulously engineered in advanced design and construction. Oscilloscope also has its own variable linear sweep. Sinusoidal sweep with phasing control for use with internal RF sweep generator when testing band pass characteristics. Synchronization provision for either internal positive, external or line frequency. External jack provided for trace blanking. Requires 10 volts of negative pulse to blank a normal intensity level trace. Independent sweep generator has a center frequency range of 1.5 to 45 megacycles giving a choice of any IF frequency desired. The band width can be varied continuously from 0.5 KC to 7 MC. Attenuation of RF is continuously variable from 0 to 500 millivolts and the output is applied through low loss coaxial cable. Traveling detector probe is included for observing signal at any point of the RF circuit under test. 105-130 volts 50-60 cycles. Weight 25 lbs. Size 14 x 18 x 12 1/2 inches. Finished in attractive hammer-tone grey. Supplied complete with tubes, probe, coaxial output cable and operating instructions ready to operate.

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speed, silent running motor. 33 1/2 RPM and 78 RPM. 3-tube amplifier. 5" PM speaker.

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SUPER 25 WATT HI-FI AMPLIFIER KIT

Including all parts, schematic and layout diagrams, enabling you to easily build this fine, deluxe amplifier.

FEATURES:

- Ready punched chassis
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- Separate bass and treble control
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- 6 tubes: 2—6SJ7, 6SC7, 2—6L6G, 5Y3
- Attractive, well-constructed steel chassis and cover. Baked hammerloid finish
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Nowhere can an amplifier of comparable features be had for twice the price. This amplifier, designed from the famous Clark Amplifier, will fill 90% of all sound uses.

\$22.95 COMPLETE WITH TUBES

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Under 1940—Universal Underdash Mounting Dials. Dealers' Price.....	\$4.41
Tuning Units 706-T1 up thru 720-T1. Dealers' Price.....	2.03
Tuning Units with switch 706-T2 up thru 720-T2. Dealers' Price.....	2.80
Volume control units 700-V1. Dealers' Price.....	.88

Volume control units with switch. 700-V2. Dealer's Price.....	\$2.12
Cable kits to fit Delco-Arvin-Philco. Dealers' Price.....	2.09
Motorola Cables. Dealers' Price.....	2.80
When ordering, specify Make, and Model of car and make and model of radio.	

Complete dial kit consists of "Head, Tuning Unit, and Volume Control Unit." We carry a complete line of all auto radio equipment and accessories.

6" Square type Auto Speaker. 4 ohm field. Replacement for all auto radios. Each.....	\$1.95
Lots of 10.....	16.50

WRITE FOR OUR LATEST CATALOG

Radio Parts Company, 614 RANDOLPH ST., CHICAGO 6, ILL.

**TELEVISION
SERVICING at a
PRICE YOU CAN PAY**

R. S. E. 3 inch TELEVISION SCOPE

Features:

**WIDE BAND VER-
TICAL RESPONSE**

FLAT TO 750kc

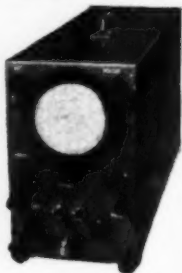
DOWN 3db

AT 1mc

VOLTAGE GAIN

OF 20 AT 5mc

AR-3



The R.S.E., AR-3 Scope has been built by Armstrong to our rigid specifications. It's a complete unit that embodies standard horizontal amplifier and sweep circuits with normal sensitivity.

The case is 8" high x 5" wide x 14" long, attractively finished in "hammered" opalescent blue enamel. Operates on standard 110 volts—60 cycles—40 watts. Tubes, 3BP1—6AC7—6SJ7—6X5—5Y3—884. Instructions included. Complete specifications upon request. Satisfaction or your money back.

PRICE

\$49⁹⁵

**F. O. B.
DETROIT**

PUSHBACK WIRE



BELOW MILL PRICES!

2,000,000 feet—tinned copper—all 1st. class, double cotton serve, waxed finish. Available 1,000 foot rolls.

22 gauge (6 colors) \$3.98 roll

20 gauge (6 colors) 4.98 roll

18 gauge (brown only) 6.49 roll



MIDGET I. F. TRANSFORMERS

Original
List \$2.10

At discounts
up to 86%

**NOW
36c
EACH**

400-500 Kc range
1 1/4" square, 3" high
hi-gain iron core.

INPUT—A826

OUTPUT—A827

Specify Type

Matched
Pair

69c

Dozen

\$3.95

Egg Crate
of 100

\$29.00



**Demand This
Seal of Quality**

ORDER INSTRUCTIONS

Minimum order—\$2.00. 25% deposit with order required for all C.O.D. shipments. Be sure to include sufficient postage—excess will be refunded. Orders received without postage will be shipped express collect. All prices F.O.B. Detroit.

**RADIO SUPPLY &
ENGINEERING CO., Inc.**
89 SELDEN AVE. DETROIT 1, MICH.

some distance from this town, but just the same, I went in expressly to get the current issue of RADIO & TELEVISION NEWS. I might add that it was 32 degrees below zero. I wonder if any of your large city hams would walk 14 miles in like weather for their copies?

"Thanking you for a good magazine." J.H.S.

Fourteen miles in 32 degrees sub-zero temperature for a copy of RADIO & TELEVISION NEWS. That is a record! It's obvious that lots of our big city hams do not realize the little effort they expend in keeping up their hobby.

HERE'S A LIKELY RECRUIT

I'D like to help someone win that \$1500 ham station. I'm not an amateur, but I want to be one, and I'm writing to you for help.

"When in the Army, I began taking the National Radio Institute course and had about a third of it completed when I was discharged. I cashed my war bonds for a Hallicrafters SX-28A and began learning code. Later I entered Purdue to study electrical engineering, but had an accident in which I broke my neck, and I've been paralyzed from the chest down since.

"I've been in the hospital since. I tried to go on with my radio, but gave up because I could no longer hold tools or equipment. Then all of a sudden, I asked myself why couldn't I go on and get my license anyway? Of course, a lot of the fun comes from building

and experimenting, but I could buy a transmitter and learn the theory well enough to pass the test. I started the NRI course all over again and bought a Hallicrafters SX-42. (Now I hope I can sell the SX-28A to pay for it.)

"Well, that's my story. I probably can't take more than 6 or 8 w.p.m. now, but when I saw the contest announcement I decided to write in the hope that you could tell me how I can get a little help with my theory. No matter how many times I read them over, I still don't understand certain things.

"I'll be very glad to have somebody help me qualify for that priceless ticket, so that at the same time I could help him get some of those prizes."

Charles Apon

Ward 84, Vaughan Hospital
Hines, Illinois

Enthusiasm like this would certainly help the cause of ham radio, and there must be an interested, already established amateur able to devote some spare time to helping Charles over the hurdles.

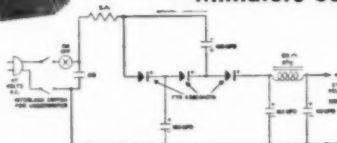
RADIO & TELEVISION NEWS CERTAINLY GETS AROUND

I READ your February issue of RADIO & TELEVISION NEWS with much interest. This is the first American radio magazine I have seen and read.

"While it is at the moment not possible to buy this fine magazine in Germany, I would like to ask your read-

ARE YOU RECTIFIER-WISE? WIN A VALUABLE PRIZE

**With your Circuit Designs Using Federal's
Miniature Selenium Rectifiers**



Here is your opportunity to convert your circuit ingenuity into a useful and valuable prize. Federal, the originator of the Miniature Selenium Rectifier, is interested in your ideas on the use of this revolutionary circuit element.

A multitude of circuits have been built around the outstanding characteristics of Federal's complete line of Miniature Selenium Rectifiers—audio amplifiers, home radios, television receivers, 'ham' transmitters, FM adapters, phonograph amplifiers and many other electrical and electronic circuits. They all capitalize on the long life, high current capacity, instantaneous starting and great efficiency of these rectifiers. This compact, lightweight television power supply is typical.

These are but a few applications. The uses of these Miniature Rectifiers are almost unlimited. Get your idea down on paper and send it in today. It may be a prize winner!

- ### CONTEST DETAILS
1. All entries must be original circuits.
 2. All entries become the property of Federal Telephone and Radio Corporation.
 3. Federal engineers will judge entries on basis of novel and useful applications and select winning circuits.
 4. Five winners will be selected from the entries received during each month of the contest. A grand prize will be awarded to the outstanding entry of the contest.
 5. All entries for this month's judging must be received by May 31. Next month's entries must be received by June 30. Final month's entries must be received by July 31. Contest closes July 31.
 6. Winners will be announced.

FIVE MONTHLY PRIZES AND A GRAND PRIZE



The five monthly winners will each receive, FREE, a Federal FTR-1342-AS Selenium Rectifier Power Supply Battery Charger. This compact unit, with its 6-volt, 6-ampere DC output, has many uses in home and shop. It comes equipped with a handy under-dash mounting socket for automobile battery charging.

The grand prize, a Federal FTR-3246-85 Radio Service Power Supply, is invaluable as a source of heavy duty, filtered DC power. Its 6-volt, 10-ampere DC output will handle auto radio testing and many other test and permanent power requirements. List price \$74.50.



MAIL YOUR ENTRY TO: MINIATURE RECTIFIER CONTEST
Federal Telephone and Radio Corporation
SELENIUM INTELIN DIV. • 900 PASSAIC AVENUE • EAST NEWARK, NEW JERSEY

ers if any of them would be willing to exchange their American magazines for German publications. I would also be very happy to exchange questions pertaining to all phases of radio. We could correspond in English or German.

"I do hope you can help me. I send my thanks to you, and congratulations on such a fine magazine."

Gebhard Auerswald, Engineer
282 Bahnhofstrasse
Lispenshausen b/Bebra
U. S. Zone, Germany

Here is a chance for some of you hams and radio enthusiasts to correspond with someone who really knows European radio. Undoubtedly, a lot of good would be realized by such an exchange of information. How about dropping Engineer Auerswald a line and comparing notes on your respective problems?

HAM CLUB FIELD DAY

THE radio ham clubs of Arizona are sponsoring a statewide Field Day contest in which amateur stations outside of the State of Arizona and in the United States are invited to participate. A certificate of award will be presented to stations outside of Arizona submitting the highest score in their call areas.

Two points will be counted for each Arizona station contacted between 2 p.m. and 12 midnight, MST, on May 14, and 7 a.m. and 3 p.m., MST, on May 15 using either c.w. or phone. The same station may be worked for full credit on different bands, and the total score is multiplied by the number of Arizona Field Day stations worked. Arizona stations operating at home locations count two points also, but may not be used as multipliers.

To enter the contest, watch for W7 stations calling "CQ Arizona" or call "CQ Arizona." Scores should be mailed not later than June 1, 1949, to SCM Gladden Elliott, 39 North Melwood, Tucson, Arizona.

HAM RADIO GOES SCIENTIFIC

DR. PAUL H. KIRKPATRICK, Stanford University x-ray expert now on sabbatical leave and spending a semester at Bowdoin College as visiting professor of physics, is making use of short-wave radio to supervise research work at Stanford on the x-ray microscope he invented.

Albert V. Baez, Stanford research assistant in physics, who is continuing the development work in Dr. Kirkpatrick's absence, speaks from amateur station W1KJU, operated by Melvin Goodwin at his home at 875 La Pera Avenue, Palo Alto. Dr. Kirkpatrick speaks from the home of Murray Litchfield, operating radio station W6WLL from a house close to the Bowdoin campus.

The hour-long, cross-country confabs are held every Monday at 2:00 p.m. (CST), or 5:00 (EST). Melvin Goodwin, who suggested the ingenious conferences, says the contacts have been very successful and that reception on the 10-meter bands has been so clear that not a word has been missed.

You Build 'em
in
ONE EVENING
but...

THEY LAST A LIFETIME!

EICO INSTRUMENT KITS

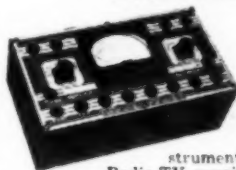
HIGH-PRECISION VACUUM TUBE VOLTMETER

Model 221-K
\$23.95

Tops in workbench versatility. 15 different ranges! AC and DC ranges: 0.5/10/100/500/1000 volts. Electronic ohmmeter ranges from .2 ohms to 1000 megohms in 5 steps. New features include Zero Center for TV discriminator alignment. DC input impedance is 26 megohms. Exceptionally accurate, big 4 1/2" meter cannot burn out. Double triode balanced bridge circuit assures stable, guaranteed performance. Sturdy portable steel case with etched, rub-proof panel. 110-130 V. AC 50-60 cycle. Size 9 7/16" x 6" x 5".

FACTORY-WIRED VTVM
Model 221. Same, but completely wired, calibrated, and tested... \$49.95

Pocket VOLT-OHM MILLIAMETER



\$14.95

Model 511-K. A "MUST" FOR EVERY SERVICEMAN! This small, handy instrument is used by every Radio-TV repairman a thousand times a day. New, improved circuit employs Germanium crystal rectifier. Large, 3" meter, attractive etched panel. Ranges: DC—0.5/50/250/2500 volts. AC—0.1/10/100/500/1000 volts. DC Ma.—0.1/10. DC Amps—0.1/10. Ohmmeter—0/500/100,000 ohms/0/1 meg. DB meter: -8 to +55 db. A PERFECT KIT FOR THE BEGINNER BECAUSE IT'S SO EASY TO ASSEMBLE.

WIRED AND TESTED
Model 511. Factory-built, ready to use. For sturdy, life-long service... \$17.95

5" SCOPE

Model 400-K
\$39.95



Quality throughout! Laboratory precision scope, for FM, AM, & TV servicing. Deflection sensitivity: .30 volts per inch full gain. Linear sweep with 884 gas triode. Horizontal sweep circuit, 15 to 30,000 cycles. Frequency response of horizontal and vertical amps is from 50 to 50,000 cycles. Provision for external synchronization, test voltage, and intensity modulation. Complete with 2-6SJ7's, 2-5Y3's, 884, and 5BP1 CR tube. Graph screen for measuring peak to peak voltages. Operates on 110 front of handsome 3-color etched, rub-proof panel. Size: 8 1/2" x 17" x 13" high. Shpg. wt. 40 lbs. As with all EICO kits, easy-to-follow Pictorial and Schematic diagrams are included. FACTORY-BUILT OSCILLOSCOPE
Model 400. The same high-quality, life-long instrument, but fully wired, assembled, and tested... \$69.95

PENCIL-TYPE HIGH FREQUENCY RF PROBE KITS

Germanium crystal probes for visual RF signal tracing and measurements to over 200 megacycles. 1/2" O.D., 6 1/2" long.
Model P-75K. Can be used with EICO Models 221, 113A, or any VTVM! \$3.75
Model P-76K. For Model 400 scope.

Models P75 or P76. Same as above but factory wired and tested. Each... \$7.50

EASY-TO-FOLLOW SCHEMATIC & PICTORIAL DIAGRAMS

come complete with every EICO Instrument Kit.

Each kit fully guaranteed to operate perfectly when assembled according to our instructions!

SCHOOLS: Special Discounts To Quantity Users.

ELECTRONIC INSTRUMENT CO., INC.
276 Newport Street, Brooklyn 12, N. Y.

RADIO ENGINEERING!

COMPLETE Radio Engineering Course. Bachelor of Science Degree. Courses also in Civil, Electrical, Mechanical, Chemical, Aeronautical Engineering, Business Administration, Accounting, Secretarial, Science. Graduates successful. 66th year. Enter June, Sept., Jan., March. Write for catalog.

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ONLY FILMGRAPH

Records Interviews, Conferences, Dictation, Telephone Conversations, AUTOMATICALLY, CONTINUOUSLY AND PERMANENTLY at less than 3 per hour.

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GOVERNMENT SURPLUS! WORLD'S LOWEST PRICE

PHOTO FLASH EQUIPMENT



COMES COMPLETE WITH 4 EDGERTON FLASH TUBES & REFLECTORS

EASY TO CONVERT INTO A 2-WAY PHOTO FLASH UNIT OPERATES ON 110V. AC & 12V. BATTERY

Brand new at a fraction of original cost. Contains finest component parts available. All necessary parts and complete instructions included. After conversion, works on 110V AC or 12V battery by a flick of a switch. \$68. WRITE FOR MORE DETAILED INFORMATION. IMMEDIATE DELIVERY COMPLETE. CINEX, INC., 165 W. 46th St., N. Y. 19, N. Y., Dept. KN-5

The ULTIMATE in BEAMS

the new *universal*
JOHNSON ROTOMATIC

With New Unidirectional Phased Array, All Elements Driven or Parasitic Arrays

Every desirable feature has been incorporated in the new JOHNSON Rotomatic plus the new JOHNSON Phased Array, a symmetrical unidirectional beam employing driven elements, which is easy to tune—performs beautifully.

Dual Band Operation

Deluxe Models of the parasitic or phased arrays are available for two band operation, employing two separate sets of elements but only one transmission line.

New JOHNSON Parasitic Array

When you see it you will realize it's in a class by itself! New, unique design allows an infinite variety of element lengths and spacing. Perfect impedance matching on two bands—any impedance from 50 to 600 ohms—coaxial or open wire line.

New Rotator and Direction Indicator

The new Rotomatic Rotator was designed for those who want the very finest. The heavy duty drive unit will take rain, sleet and high winds in its stride—will turn on the coldest mornings. Rotation is instantly reversible, 360° at 1 1/4 RPM. Motor control and antenna relay switch are contained in the selsyn indicator case.

The elements, rotator, direction indicator, etc. may all be purchased separately.

Write for folder fully describing the "NEW JOHNSON ROTOMATIC" or see it at your jobber.



JOHNSON

E. F. JOHNSON CO.

WASECA, MINN.

Plate Dip Unit

(Continued from page 43)

in measurements, the search coil should be coupled as loosely as possible to the circuit under test.

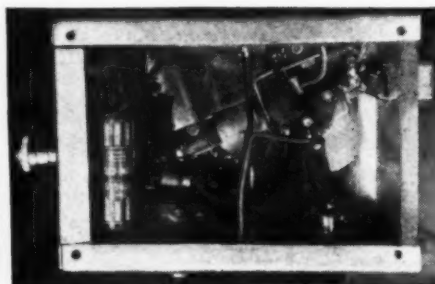
A further word about the dial. After marking the calibration points with India ink, the dial was treated with an oil coloring. The oil colors were purchased from a photograph shop in the form of a beginner's hand coloring set for about a dollar. The little kit contains 8 shades in an amount suitable for coloring literally hundreds of dials and perhaps some pictures, too. The colors are applied with a tiny wad of cotton around the end of a toothpick and no talent is required to make a very presentable dial with a different color for each band. If you are not satisfied at first, you can remove a part or the whole thing with a solution included in the kit and start over again. After several days, the whole dial can be given several coats of lacquer and the job is made permanent. To identify coils with the proper dial calibration, a dot of color is put on the inside of the coil forms. This type of coloring system is, of course, adaptable to the commercial home-calibrated dials made by Bud, Millen, and National.

To try and mention all the possible uses of an instrument such as this plate dip meter is a gargantuan task as the applications are limited only by the ingenuity of the user. However, a few of the primary functions can be here summarized: The resonant frequency of circuits can be measured or adjusted to desired range without requiring any energy in the circuit itself, hence a transmitter can be tuned without the power turned on and a trap can be similarly adjusted. Antenna resonance can be found by coupling the search coil to the end of the antenna or the feed system.

As a signal generator, set the dial to the frequency desired and align your equipment. If modulation is a must, connect a switch in the negative return of the filter condenser; this will cause the oscillator to be modulated at the supply frequency.

In the non-oscillating condition, the meter will read upward when reso-

Interior view of unit. Note short, heavy lead from tuning condenser to coil socket, and bracket mounting of tube socket on condenser. Control is "full scale-zero adjust." A penlight cell provides bucking current.



Easier Antenna Installations



STAR TAMPIN



STAR DRYVIN



STAR STAZIN



STAR SPRINGIN

Star Expansion Bolts make it easy to fasten TV equipment to brick, stone, concrete or any other type of masonry. Help you to position antenna masts, cables and lines in the best possible manner... assure greater satisfaction; reduce service calls. There's a Star fastening for every masonry job. See your jobber or write for details.

★ STAR EXPANSION BOLT CO. INC.

147 Cedar Street, New York 6, N. Y.

SENSATIONAL! NEW! SOUND POWERED TELEPHONE HANDSET



- No Batteries Needed
 - No Power Supply Needed
- HIGH FIDELITY SPEECH TRANSMISSION**

Ideal for emergency or convenience applications. Operates up to 25 miles with No. 16 twisted wire; up to 15 miles with No. 19. And no auxiliary power is needed. Also operates over single wire with ground return. As many as 12 handsets can be operated in communications systems for group conversation. Explosion proof. No fire hazard. No spark is generated. Guaranteed one year by Wheeler Insulated Wire Co. (Div. of Sperry Co.). Shipping weight 3 pounds. Immediate delivery.

\$9.95

GIBSON GIRL SALE!

NYLON PARACHUTE Bright yellow. Supports 40 pounds. With Nylon shrouds... **\$4.95**
4' DIAMETER PURE RUBBER BALLOON Vacuum packed with Hydrogen generator, inflation tube and instructions... **\$3.49**
BOX KITE—LARGE 17" x 17" x 36" Dural tubing, feather weight. Snaps together in a jiffy. Adjustable for wind. Instructions included... **\$2.95**
ANTENNA WIRE 300' spool. Use in conjunction with kite or balloon for super antenna. High tensile strength... **\$1.95**
WATERPROOF SIGNAL LAMP With cord. Will float in water with no injury. Spare lamp included... **\$1.00**
FAMOUS GIBSON GIRL XMITTER 500 kc. CW or modulated signals. Automatic keyer. Self powered hand generator. Water proof case. Made with latest design practices. Good ideas, good parts. Power supply furnished. Can be used for emergency field station by simple conversion. Manual included... **\$8.95**
THE WHOLE WORKS! A \$28.00 VALUE With two balloons and two spools of wire (Bag included at no charge)... **Only \$16.95**

ABELL DISTRIBUTING CO., Dept. N6
5 E. Biddle St. Baltimore 2, Md.

nated to an r.f. source and can be used as a sensitive field strength meter, an absorption frequency meter, a harmonic checker, a parasitic hunter, a sensitive neutralizing indicator, and, of course, a phone monitor.

Still other applications of this handy gadget can be found and once a "build-it-yourself" ham or experimenter has one, he won't part with it for love or money.

-50-

FM Booster

(Continued from page 41)

It was found that the use of the preamplifier resulted in a great improvement in receiver sensitivity. Stations that were barely audible in the background noise were brought up to a point where very little noise was noticed, while the total number of stations logged was more than doubled.

As a most convincing demonstration of the performance of the preamplifier, the antenna can be replaced with a 300-ohm, 1/2 watt carbon resistor. A certain amount of noise, which appears as a smooth, rushing sound, will be noticed at the receiver output. If the thermal energy of the resistor is increased by raising its temperature, the Johnson noise will appear as an increase in the receiver output. If a lighted match is held under the resistor for a few seconds, the noise may increase to a point where it is practically deafening. Before you build the preamplifier, make this test with the receiver alone!

Other Applications

Although the booster described was intended particularly for the FM band, it can be used on the 10, 6, and 2-meter amateur bands merely by changing L_1 , L_2 , and L_3 . Also, with suitable coils it should perform well ahead of a television receiver. The band width is sufficient to cover two adjacent channels. In making these changes, it will be necessary to determine coils L_1 , L_2 , L_3 , and L_4 experimentally.

-50-



Our 26th Year

LEEDS
The Home of RADIO

QUALITY - PRICE
DEPENDABILITY

PLATE TRANSFORMERS									
For Small Transmitters. DC Voltage Ratings are Approx. Values Obtained at Output of a 2 section Choke input Filter. Using Mercury Vapor Rectifier Tubes Pri. is for 115 V. 60 cy. Dimensions									
Type No.	Sec. Rms. Volts	Sec. DC Volts	Sec. MA.	H.	W.	D.	Price Each		
P 57	660-660+	500	250	4 1/2	3 1/2	4 1/2	\$ 6.76		
P 58	1080-1080	1000*	125	4 1/2	3 1/2	5	8.23		
P 59	900-900	750	225	4 1/2	3 1/2	5 1/2	7.94		
P 67	1450-1450	1200	300	5 3/4	6 1/8	4	19.84		
P 68	2100-2100	1750	300	5 3/4	6 1/8	4 1/4	24.99		



SUPERIOR POWERSTATS
Smooth, efficient voltage control. 0 to 135V. output from 115V. AC line.
Type 20 (illustrated) 3 amps. \$12.50
116 for table mtg 7.5 amps. 23.00
116U for panel mtg 7.5 amps. 19.00
1126 15 amps. 46.00
1156 45 amps. 118.00
Also available for 230 volt input. Write for descriptive literature.

OIL FILLED CONDENSERS	
1.78 Mfd @ 200VAC	29c
4 Mfd @ 500VDC	39c
1 Mfd @ 600VDC	29c
2 Mfd @ 600VDC	39c
7.5 Mfd @ 330VAC	69c
10 Mfd @ 1000VDC	98c
2 Mfd @ 1000VDC	39c
.05 Mfd @ 2500VDC	95c
1 Mfd @ 5000VDC	\$2.95
2x.1 Mfd @ 7000VDC	\$2.00

GREENLEE PUNCHES	
Cuts to 1/8" thick metal.	
1/2"	\$1.94
1"	\$1.94
1 1/2"	\$2.12
1-3/16"	\$2.25
1 1/2"	\$2.25
1 3/4"	\$2.25
2"	\$2.88
We carry a complete line of all sizes of punches up to 3 1/2" diameter.	

FILAMENT TRANSFORMERS	
Type 940 2.5VCT @ 10 Amps. 2500V Ins.	\$2.79
Type 940 5. VCT @ 3 Amps. 2500V Ins.	\$2.06
Type 941 5 VCT @ 6 Amps. 2500V Ins.	\$3.38
Type 943 5 VCT @ 20 Amps. 2500V Ins.	\$5.29
Type 946 6.3VCT @ 3 Amps. 2500V Ins.	\$1.91
Type 947 6.3VCT @ 6 Amps. 2500V Ins.	\$2.79
Type 948 6.3VCT @ 10 Amps. 2500V Ins.	\$3.67
Type 960 7.5VCT @ 8 Amps. 2500V Ins.	\$2.35
Type 143 7.5VCT @ 10 Amps. 3000V Ins.	\$4.12
Type 146 10 VCT @ 3 Amps. 2500V Ins.	\$4.99
Type 961 Dual 6.3VCT @ 3 Amps. 2500V Ins.	\$3.38
Type 041 5VCT @ 3 Amps. 2500V Ins.	
6.3VCT @ 3.6 Amps.	

GRID DIP METER
LYSCO
"DIPMASTER"
3Mc. to 150Mc. freq. range; calibrated dial, band switching (no coils to plug-in). Complete power supply and tubes. A really good buy.
\$33.50

ISOLANTITE Sockets for 832's or 829's
ISOLANTITE Sockets for octal tubes
STEATITE Sockets for 813 and other large 7 pin tubes
3C24 Triode Each 39c, 10 for \$3.50

TRANSFORMER SPECIAL
870 volt CT @ 250Ma with 80V bias tap
5 volts @ 3 amps
2 1/2 volts CT @ 10 amps
2 1/2 volts @ 3 amps
6.3 volts @ 1.5 amps
115V. 60 cycle primary
\$5.88

SCOPE & TELEVISION TRANSFORMERS & CHOKES	
2500V. RMS @ 5 Ma D.C.-6.3V. @ 3 amps tapped at 2.5V. @ 3 amps; 2.5V. @ 2 amps; Type P-3171	\$6.76
1700V. RMS @ 2 Ma D.C.-6.3V. @ 9 amps tapped at 2.5V. @ 2 amps; 2.5V. @ 2 amps; Type P-3170	\$5.14
2 Hys @ 250 Ma D.C. 50 ohms type C-2991	\$1.62
2 Hys @ 200 Ma D.C. 50 ohms type C-2974	\$1.92
VERTICAL BLOCKING OSC. turns ratio pri. to sec. 1:4.2	
Unshielded type A-3000	\$1.18
Shielded type A-4000	1.62
HORIZONTAL BLOCKING OSC. turns ratio pri. to sec. 2:1	
Unshielded type A-3002	\$1.32
Shielded type A-4002	1.76
VERTICAL OUTPUT turns ratio pri. to sec. 10:1	
Unshielded type A-3035	\$3.09

STEEL CHASSIS	
Black Crackle	
5x10x3 18 Ga.	\$.97
11x17x3 16 Ga.	1.94
13x17x3 16 Ga.	2.35
13x17x4 16 Ga.	2.70

ALUMINUM CHASSIS	
Heavy Duty	
7 x 7 x 2	94c
7 x 9 x 2	\$1.04
5 x 10 x 3	\$1.00
7 x 11 x 2	\$1.15
10 x 17 x 2	\$1.23
10 x 17 x 3	\$1.88

CHOKES	
SMOOTHING	PRICE EACH
TYPE Hy	TYPE MA
C-80 10 C-87 4-16	150 \$3.09
C-81 10 C-88 4-16	200 \$3.82
C-82 10 C-89 4-16	250 \$5.29
C-83 8 C-90 3-14	300 \$5.59
All above 3000 Volts Insulation	

RAYTHEON VOLTAGE STABILIZERS	
Positive Stabilization ± 1/2% Input 95-130 volts, 60 cycles single phase; output 115 volts stabilized to ± 1/2%. *Output 6.0 or 7.5 volts stabilized to ± 1/2%.	
Catalog No.	Output Net Cap. wgt. Net Warts lbs. Price
VR-6110	15 4 \$15.00
VR-6101*	30 5 \$17.00
VR-6111	30 5 \$17.00
VR-6112	60 8 \$24.00
VR-6113	120 14 \$31.00
VR-6114	250 25 \$48.00
VR-6115	500 45 \$75.00
VR-6116	1000 92 \$125.00

OIL FILLED BATHTUBS
19c Each \$10.00 Per 100.
All 600VDC in following sizes: .05 Mfd., .1 Mfd., 2x.1 Mfd., 3x.1 Mfd., .01x.3 Mfd.

ISOLATION TRANSFORMERS
All 117 Volts to 117 Volts 60 Cy.
P-96, 40 watts \$3.60 P-98, 100 watts \$9.30
P-97, 80 watts \$5.10 P-99, 250 watts \$17.70

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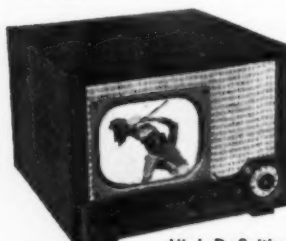
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CT-102
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High Definition Table Model with 10" screen. Thrilling performance. 22 tubes (including 2 rectifiers and damper). Tuning range 44-88, 174-216 MC. Beautifully designed hand-rubbed cabinet in mahogany or walnut veneer. Dimensions: 20"x14"x20".

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132

NEW TV RECEIVERS on the Market

ALL-MIRROR TV SET

The all-mirror television receiver, named the Pandora 15, produced by Sightmaster Corp., 20 E. 35th St., New York, N. Y., has safety glass mirror for sides, and the exclusive feature of "Sightmirror" on the viewing side.



This 15-inch glass tube set is listed at \$675.00.

The Sightmirror principle is aimed at providing an attractive front on the receiver when it is not in use. The mirror eliminates the unattractive dead space, and when the set is in use, the television picture comes through as a soft filtered picture. So that no knobs are necessary, it is tuned in by a remote control unit that can be operated from an armchair.

This new model will be distributed nation-wide through the organization sales system.

FOUR-WAY TV COMBINATION

The Sperton Radio-Television Division of The Sparks-Withington Company, Jackson, Michigan, recently introduced among its new line of television models a TV console in mahogany finish, priced at \$399.95, east of the Rockies.

This new console, Model 4916, has a



ten-inch screen with 54-inch picture, automatic brightness control, 28-tube chassis, and a choice of mirror-view or direct-view screen. In common with

the other models, this console has a dual-purpose, single-arm, two-speed record changer, for playing standard records at 78 r.p.m. and long playing records at 33 1/4 r.p.m. automatically.

In the first of a number of showings, these combinations were unveiled to Sperton dealers of the Detroit area and it was hoped to bring them to all major television markets soon.

17-TUBE LOW-PRICED TV SETS

Model 807, part of the new line of table television receivers coming from General Electric's Electronics Park, Syracuse, N. Y., is mounted in a compact blond oak cabinet, at the list price (eastern) of \$289.95. It uses a simplified circuit design, necessitating only 17 tubes and three rectifiers in addition to the 10-inch picture tube.

Three table models, 805, 806, and 807 comprise this new line, along with Model 809, a contemporary console in



mahogany finish. All of the sets, with the exception of 805, listing at \$239.95, will have "Daylight" television tubes, said to produce pictures 80 per-cent brighter than other tubes operating under the same conditions.

All of these new receivers are pre-tuned to the 12 television broadcast channels and are equipped with the G-E automatic clarifier, a stabilization circuit intended to reduce the interference caused by passing automobiles or unfiltered electrical appliances.

"GUEST TELEVISION" SYSTEM

The system designed and manufactured by Industrial Television, Inc., 359 Lexington Avenue, Clifton, N. J., was scheduled to be installed in the Loudon-Knickerbocker Hall sanitarium in Amityville, New York, according to a recent announcement.

This so-called "guest television" system incorporates many features necessary in an institution of this type. All of the tuning will be done at the central control unit. The individual picture units use a 15-inch picture tube and have absolutely no operating con-

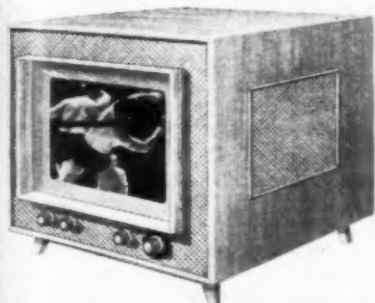
RADIO & TELEVISION NEWS

controls. Shatterproof plexiglass covers the picture tube.

The receivers are to be installed in the recreation rooms of the various sanitarium buildings with provision to expand the system to the sanitarium theater.

VIDEO LARGE-SCREEN TV

One of the new features of the Video Corporation of America line of low-priced receivers is the inclusion of a circuit, the "plakron compensator,"



which produces a high-fidelity picture in much the same way that a tone control increases the tonal range in a radio receiver.

One of these models, priced at \$459.00, is a new 135 square inch, direct-view table receiver, scheduled for dealer delivery. Others include a 91 square inch table model at \$359.00 and a 91 square inch console at \$379.00. In addition, there is a 135 square inch console with sliding door and hidden controls that turn the receiver into a handsome furniture piece, priced at \$499.00.

According to the manufacturer, Video Corporation of America, 229 West 28th Street, New York City, particular attention was paid to the development of these models, to make them trouble free in performance. All heat producing components that tend to deteriorate parts have been eliminated.

CROSLEY TV-AM-FM CONSOLE

The Crosley so-called "complete-entertainment" television-radio-phonograph consoles include the blond oak Model 9-414B, in the functional lines



and smart finish of the modern motif, at \$529.95.

The new line provides Crosley spectator television reception with the 10-inch direct-view picture tube, both

ANNOUNCING

A STRIKING NEW MICROPHONE BY TURNER

THE TURNER MODEL 25X-25D CRYSTAL OR DYNAMIC



New . . . all new from its precision engineered crystal and dynamic circuits to its specially designed case. The Turner 25X-25D combines quality performance, convenience, and style with world famous Turner dependability. Features include Alnico V magnets, high quality moisture sealed crystals, smooth, wide range response to voice and music pickups, 90° tilting head for semi- or non-directional operation, 20 ft. removable quick-change cable set, mechanical-shock proof interior mounting, and high quality construction throughout. Finished in attractive two-tone umber gray with chrome plated grill.

The new Turner 25X-25D may be mounted on desk stand as illustrated or used with any standard floor stand. It is recommended for call system, public address, recording, amateur communications and general-purpose sound work.

GENERAL SPECIFICATIONS

MODEL 25X CRYSTAL

Response: Substantially flat from

50 to 9,000 c.p.s.

Level: 52 db below 1 volt/dyne/sq.cm.

MODEL 25D DYNAMIC

Response: Substantially flat from 50 to 10,000 c.p.s. Level: 54 db below 1 volt/dyne/sq. cm. at high impedance. 30, 200, and 500 ohms—wired for balanced line. High impedance—wired single ended.



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frequency modulation and standard broadcast reception, and an automatic phonograph with two-speed player and the *Crosley* jewel-tone system. In addition, there are record library storage spaces on either side of the record playing compartment. The consoles have full-length panel doors which can be closed to put them in complete harmony with the room settings when the instrument is not in use.

The *Crosley Division, Avco Manufacturing Corporation*, 1329 Arlington St., Cincinnati 3, Ohio, will be happy to supply further information on these sets.

NEW FREED-EISEMANN TV MODELS

All of the television receivers manufactured by the *Freed Radio Corporation*, 200 Hudson Street, New York 13, N. Y., use the 16-inch metal tube. In a recent demonstration, a specially-invited group of retailers from the East saw four new consoles, which marked *Freed Radio Corporation's* entrance into the television market.

These *Freed-Eisemann* models are housed in period design cabinets with a high eye level, permitting strain-free viewing from any part of the room, without a disorderly rearrangement of furniture directly in front of the receiver.

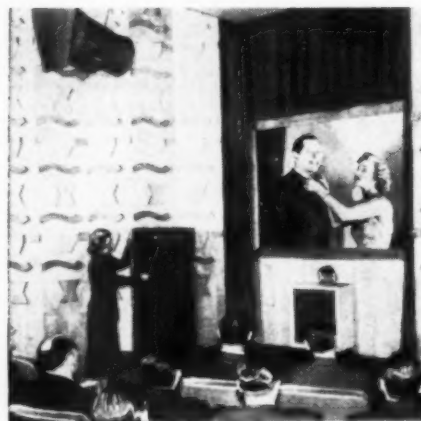
According to Arthur Freed, president of *Freed Radio Corporation*, the company's entire engineering and production efforts would be devoted to television models with the 16-inch

metal tube. The consoles are available in Sheraton, Chinese Chippendale, Regency, and Chippendale styles, and the retail prices range from \$625 to \$1295.

LIFE-SIZE TV

A new life-size television projection system, featuring an optical barrel which is suspended from a convenient ceiling mounting, has been announced by the *RCA Engineering Products Department*, Camden, New Jersey.

The system is especially adaptable



for use in night clubs, hospitals, taverns, clubs, hotels, industrial plant recreation, and lunch rooms. The ceiling mounting lends itself to built-in applications in harmony with a room's

decorations, and the space-saving aspect of the installation is also a major feature.

The optical barrel is connected to the control console by a 40-foot cable. In use, the barrel is focused on a screen up to 6 by 8 feet in size, of either the front or rear-projection type.

The system (TLS-87) has a 30-watt amplifier, with microphone and phonograph inputs provided so that the unit can be used as a public address system when television programs are not on the air.

FIRST UST CONSOLETTTE

The first 15-inch television-radio consolette to be produced by *United States Television Mfg. Corp.*, 3 West 61st Street, New York 23, N. Y., features a Zetka 15-inch glass viewing tube with a flat face to provide more picture space. The tube has an ion trap which is designed to eliminate ion stain, an eye disturber which sometimes occurs in tubes without this feature.

A full consolette, this model does not require the use of any supporting furniture, and has, besides large-screen television, FM radio reception. It is priced at \$625, which the manufacturer feels is comparable to 16-inch metal-tube table models at the \$500 level, since these do not have FM radio, and the consumer must have a supporting table.

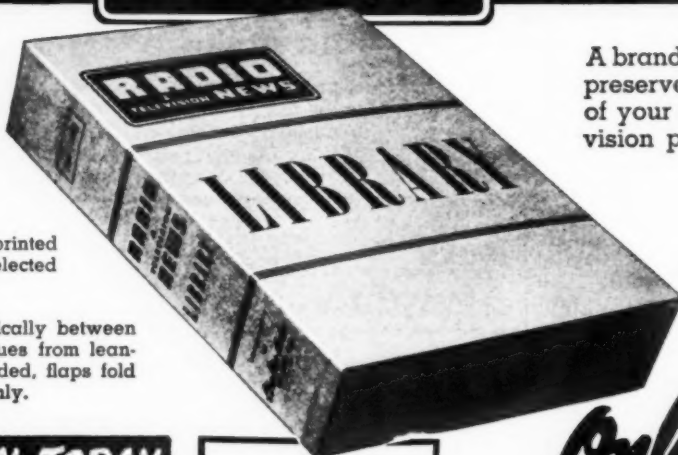
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pre-war days, *United States Television Mfg. Corp.* will distribute its models on a national scale. Other *UST* models range from 10-inch table models to large-screen projection TV sets for public places.

THEATER TELEVISION

Television on a life-size 6 by 8 foot screen is a major attraction at Walter Reade's *New Majestic Theater* in Perth Amboy, New Jersey. The theater reopened recently upon the completion of a \$150,000 remodeling program that included installation of the video lounge.

This special 40 by 25 foot lounge was installed as an additional patron service. There is no charge for admission to it—the patron may see both the theater's screen attraction and the television while in the theater.

The set used is the new *RCA TLS-86*, housed in a portable wheeled cabinet. From a spot 14 feet away from the center of the screen, it throws a picture 6 by 8 feet in size. It replaces a 20-inch tube television set installed nearly two years ago and at that time the largest available.

According to Walter Reade executives, the present television picture is the largest ever presented publicly in New Jersey, and the biggest direct video pictures ever unveiled for regular daily viewing.

HOFFMAN 16" COMBINATION

The *Hoffman Radio Corporation*, 3761 S. Hill St., Los Angeles, California, announces that a new combination radio-phonograph and television receiver has been released, which features the new 16" metal tube.

In cabinet style, the set, Model 902, is a twin of the company's Model 900, but the new combination's 16" metal tube presents a particularly clear,



crisp, and bright image to the viewer, according to the manufacturer. This is especially true when used in conjunction with the Easy-Vision Lens.

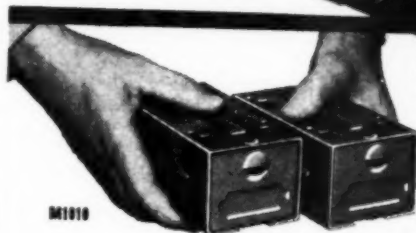
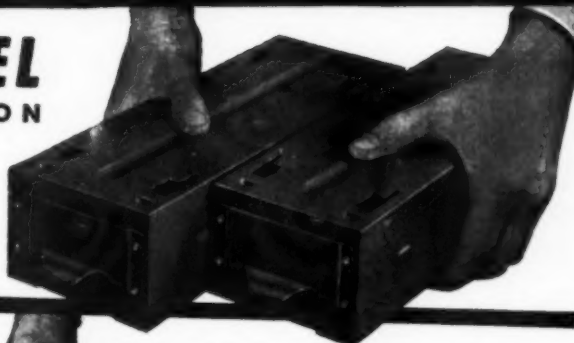
Other features of the Model 902 include a 12" acoustically treated speaker, plus such regular *Hoffman* TV features as an automatic picture synchronizer which locks the picture in focus electrically. It is housed in a blond oak cabinet, 37 by 40 by 21 inches.

—50—

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Assemble quickly
Units rigidly interlock
Smooth drawer operation
Durable green finish



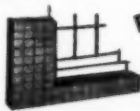
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AN ACCURATE POCKET-SIZE

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(Sensitivity: 1000 ohms per volt)

Features: • Compact—measures 3 1/4" x 5 1/4" x 2 1/4". • Uses latest design 2% accurate 1 Mil. D'Arsonval type meter. • Same zero adjustment holds for both resistance ranges. It is not necessary to readjust when switching from one resistance range to another. This is an important time-saving feature never before included in a V.O.M. in this price range. • Housed in round-cornered, molded case. • Beautiful black etched panel. Depressed letters filled with permanent white, insures long-life even with constant use.

Specifications: 6 A.C. VOLTAGE RANGES: 0-15/30/150/300/1500/3000 volts. 6 D.C. VOLTAGE RANGES: 0-7 1/2/15/75/150/750/1500 volts. 4 D.C. CURRENT RANGES: 0-1 1/4/15/150 Ma. 0-1 1/2 Amps. 2 RESISTANCE RANGES: 0-500 ohms. 0-1 Megohm.

The Model 770 comes complete with self-contained batteries, test leads and all operating instructions.

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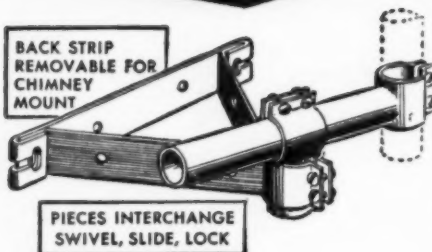
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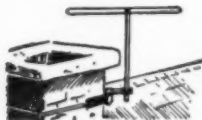
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Mounts on horizontal or vertical window sash... swings antenna clear of obstructions. NO GUY WIRES.

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Name.....

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TV Antenna Compass

(Continued from page 69)

should be temporarily disabled during any measurements. This is easily done by following the directions of the manufacturer for service or alignment of the video channel. Since such a receiver having a.g.c. would automatically attempt to adjust its gain to compensate for a weaker or stronger signal, any antenna adjustments, with or without the use of the Simpson antenna compass, to be at all informing, would have to be done with such a.g.c. disabled.

One of the first questions to come to the mind of the reader is—"How can it possibly show ghosts?" Well, it will, *provided the ghost is of the type about which anything can be done by orientation or location of the antenna.* It is not generally realized that there are actually at least three types of ghosts (displaced images) which appear on the TV screen. While a thorough discussion of this subject is beyond the scope of this article, the problem may briefly be stated as follows.

First, there is the ghost due to mismatch of the impedance of the antenna, the transmission line, and/or the receiver input circuit. The reflections, due to this mismatch, coursing back and forth along the transmission line, cause a slight time delay in the impulses supplied to the picture tube. With any reasonable length of line, and not too bad a mismatch, this time delay is usually so slight that actual multiple images do not appear, but a general loss of horizontal definition may result, giving the effect of poor focus and a lack of crispness to the image. Obviously, no change in orientation of the antenna will cure this; the solution lies in a good match. This is by no means an easy job when all-channel operation is considered. There is a lot of room for development work on TV receiving antennas.

The second type of ghost originates near the transmitting station. Reflections which are caused by objects located relatively near the transmitter arrive at the receiving site from nearly the same direction as that of the prime wave, but delayed in time. This time delay causes the displaced image. Now, with any practical receiving antenna, the horizontal directivity is so broad that the antenna is unable to discriminate between waves arriving from directions displaced by only a few degrees. Again, obviously, no practical change in location or orientation of the receiving antenna can cure this trouble. This is a real problem, and it does not appear that it can be solved at the receiving site but is rather one for the transmitter engineers. The selective removal of a few large office buildings would undoubtedly help matters, but appears a bit impractical.

The third type of ghost, (and this is the one that we can do something

about), originates from reflections relatively near the receiver and sufficiently off-axis from the prime wave so that the acceptance pattern of the receiving antenna can discriminate against it. Fig. 1D shows how this time delay due to longer path, and directional difference due to reflector location, originates. Now, assuming that the source of such a reflection is displaced at least twenty degrees or so from the path of the direct wave, we can, by rotating the antenna somewhat to the opposite side of the peak, reduce the ghost to negligible proportions without reducing the prime wave too greatly. Such adjustments must always be a compromise between allowable diminution of the prime wave in relation to the strength and direction of the ghost.

Now, if we know the direction from whence the ghost arrives, we can much more rapidly and intelligently discriminate against it. It is gratifying to see how well the use of the meter shows up this direction, and, therefore, the direction to which the antenna should be turned to nullify it. By slowly rotating the antenna while watching the meter pointer, if no directionally displaced ghosts are present, the curve will be a smooth one, rising to a peak and falling off uniformly on the opposite side. This, of course, assumes that the antenna itself has a smooth acceptance pattern. Now, as shown in Fig. 1C, if the movement of the pointer is non-uniform, falling off more slowly on one side of the peak than on the other, or actually showing a smaller sub-peak, off-axis reflection is present, and the remedy is obvious. Simply rotate the antenna to the side of the peak away from the ghost direction, and you have done all that the present state of the art permits.

The design of this instrument is the outgrowth of a good deal of antenna measurement work done by the writer during the past few months. The comparison of various types of indoor and outdoor TV antennas here in Des Plaines, about twenty miles from our group of four Chicago TV stations, necessitated the use of some sort of indicating instrument. While the setting up of a signal generator and a simple field-strength indicator would be obvious, it seemed simpler (and cheaper) to use the TV transmitters as the generators and the TV receiver itself as the amplifier. There are many places in the receiver circuit where an indicating instrument could be connected for comparative purposes, such as a VTVM across the video channel or a milliammeter/microammeter in series with the video diode load or the a.g.c. load. All such measurements are, of course, merely comparative and are not quantitative, but if the gain of the amplifier (receiver) remains constant, and comparisons are made rapidly enough so that wave propagation conditions do not materially change, and if the power output and picture modulation of the trans-

mitter does not change, such comparisons are quite reliable, capable of duplication, and extremely informative.

Repeated trips from the test antenna site to the receiver site, to see what change had been effected, speedily made it obvious that if the indicator could be taken to the antenna a good many footsteps and much climbing effort could be saved. The use of a long extension cord between the probe and the meter soon made it apparent that such an indicator would be a useful tool for the TV installation man. In order to make a commercially practical instrument, however, it was necessary to find a connection location in the circuit of the TV receiver which would, first of all, be representative of the video output (and, therefore, the input); second, be universal to all TV receivers; and third, be easily accessible, on the job, without recourse to the wire clippers and soldering iron or the necessity of getting into the chassis wiring.

The obvious place for this is the picture tube itself, since the voltage supplied to its controlled electrode is representative of the input and all such tubes are so connected that the flexible leads are easily accessible. The special test clip with the needle-point contact makes connection to the controlled electrode easy, without insulation scraping or other nuisances.

The probe contains a resistance-capacitance network, an isolation condenser, and a crystal rectifier to actuate the meter movement. The constants of the network and the sensitivity of the meter have been chosen to disturb the video circuit as little as possible, and, generally, negligible change in picture appearance is noted with connection of the probe. For convenience, the clip may be removed from its junction box without disconnection from the picture tube lead, by a plug-in arrangement.

The meter, in conjunction with its probe, gives an indication directly proportional to the integrated r.f. voltage applied to the picture tube by the received energy from the transmitter. Since the probe contains an isolation condenser, the d.c. level of the controlled electrode makes no difference, and, therefore, the "brightness" control and other receiver controls have no effect. Only the video gain (contrast) and, of course, the tuning control affect the meter reading.

With the intelligent use of this instrument the TV installation and serviceman can now make an antenna adjustment in a truly engineering manner, eliminate a great deal of "cut-and-try," and substitute actual measurement for personal opinion and guesswork. He can leave the home of the owner of a nice, new, shiny TV receiver confident that he has done the best job possible in this particular receiving location, and in the course of time save up a good many man hours for that long fishing trip that we all dream about!

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Complete with mounting brackets. 5 Ohm 7.5-5.8 Amp. 125 V with Knob & Pointer, 6 1/2" Dia. West'n Inc. \$5.25.
42 Ohm 5.5 Amp. 125 V with Knob & Pointer, 12" Dia. Gen. Elec. \$10.95

PLUGS

PL-150 Plug for Dynamotor Socket on Xmit. HC-223. \$0.30
2-PL-55 Plugs on 35" Cord. \$0.39
PL-55 Plug on 35" Cord. \$0.23
JK-26 & PL-55 on 67" Cord. \$0.49

POWER EQUIPMENT

Inverter PE-151 12VDC Output 110 VAC 150W. New. \$10.95.
Vibrator ATR. 2410 24VDC Output 110 V 100 Watt. New. \$2.95.
Vibrapak VPG 369 12VDC Output 250V @ 70MA Synchronous Motor. New. \$3.45.
Voltage Regulator, Raytheon 95/130V 1.25A 60 Cycle Output 115V 60 Watt. New. \$9.50.
Inverter ATR 12VDC 110VAC 50/60 cycle 100W. New. \$14.75.
GN-45 Hand Generator 6 Volt 3 Amp. 500 Volt 0.14 Amp. less Handles. Used Good Condition. \$3.50.
Generator Voltage Regulator 115V 400 Cycle GE. 2 GBA-206. \$22.95.
AC Contactor 110V 60 Cycle 50 Amp 3PST GE. \$18.95.

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For Cathode Ray—X-Ray
High Power Transmitting Tubes

- High Vacuum and Mercury Pump with Micron Gage
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Mfd. by General Electric Co.

CAPACITORS

MATCH BOX	EACH	TEN
5 mfd	400 VDC Solar	\$.20
2X.05 mfd	600 VDC Solar	.25
1 mfd	600 VDC Aerovox	.25
2X.1 mfd	600 VDC Aerovox	.25
25 mfd	600 VDC C.D.	.25
3 mfd	600 VDC Aerovox	.25

BATHUBS

40 mfd	25 VDC	.30
4 mfd	100 VDC	.40
3X.1 mfd	400 VDC	.30
2 mfd	400 VDC	.45
95 mfd	600 VDC	.20
25 mfd	600 VDC	.25
5 mfd	600 VDC	.30
1 mfd	600 VDC	.30
95 mfd	1,000 VDC	.55
2X.1 mfd	1,000 VDC	.40

OIL FILLED GE PYRANOL

5-5 mfd	600 VDC	.35
1 mfd	500 VDC	.30
2 mfd	600 VDC	.35
4 mfd	600 VDC w/clamps	.30
To be		
4 mfd	600 VDC	.50
6 mfd	600 VDC	.60
8 mfd	600 VDC	.90
10 mfd	600 VDC	1.10
2 mfd	1,000 VDC	.55
1 mfd	1,500 VDC	.55
25 mfd	3,000 VDC	1.95
5 mfd	3,000 VDC w/clamps	2.00
To be		
5000 mfd	15,000 VDC	6.95

PAPER

3-8 mfd	600 VDC	1.00
8-8 mfd	650 VDC	1.49
2X160 mfd	150 VDC	1.49
2X160 mfd	150 VDC	1.65

ELECTROLYTIC

2500 mfd	3 VDC	.35
24,000 mfd	3 VDC	4.91
500 mfd	200 VDC	1.00

CAT. No.

WIREWOUND	OHMS	WATTS	TAPER	BUSHING	SHAFT	MFG	CHIC TEL	EACH	TEN
093B1	10,000	2	LINEAR	1/2"	5/8"	WIRT	30	.25	.25
003B5	50,000	2	LINEAR	1/2"	17/8"	TREZ	30	.25	.25
006B2	1,000	3	LINEAR	1/2"	17/8"	WIRT	30	.25	.25
005B10	25,000	3	LINEAR	1/2"	17/8"	TREZ	27	.22	.22
149B1	5,600	4	LINEAR	1/2"	17/8"	OHMITE	45	.40	.40
OHMITE	20	25	LINEAR	1/2"	17/8"	OHMITE	55	.45	.45
207B2	25	25	LINEAR	1/2"	17/8"	OHMITE	55	.45	.45
OHMITE	100	25	LINEAR	1/2"	17/8"	OHMITE	55	.45	.45
142017	1,000	25	LINEAR	1/2"	17/8"	OHMITE	55	.45	.45
144B2	1,000	25	LINEAR	1/2"	17/8"	OHMITE	55	.45	.45
155B1	15,000	25	LINEAR	1/2"	17/8"	OHMITE	55	.45	.45
099	20,000	25	LINEAR	1/2"	17/8"	OHMITE	55	.45	.45
OHMITE	800	50	LINEAR	1/2"	17/8"	OHMITE	110	.95	.95
079	400/400	50	LINEAR	1/2"	17/8"	OHMITE	110	.95	.95
HELIPOT	20,000	65	5	LINEAR	1/2"	OHMITE	450	4.00	4.00
CARBON									
101	500	2	LINEAR	1/2"	17/8"	AB	25	.20	.20
084	10,000	2	LINEAR	1/2"	17/8"	AB	25	.20	.20
134B1	20,000	2	LINEAR	1/2"	17/8"	AB	25	.20	.20
120B1	25,000	2	LINEAR	1/2"	17/8"	AB	25	.20	.20
125B1	50,000	2	LINEAR	1/2"	17/8"	AB	25	.20	.20
086	100,000	2	LINEAR	1/2"	17/8"	AB	25	.20	.20
087	200,000	2	LINEAR	1/2"	17/8"	AB	25	.20	.20
151B2	200,000	2	LINEAR	1/2"	17/8"	AB	35	.30	.30

ROUND PANEL METERS

10-0 +6DB	Weston 506 2 1/2"	\$4.50
0-4 RF AMPS	GE	4.00
0-5 RF AMPS	Westing.	3 1/2
0-15 RF AMPS	GE	3 1/2
0-100 MA DC	Simpson	3 1/2
0-300 MA DC	Simpson	3 1/2
5-0-5 MA DC	Weston with 50 MA	4.25
0-8 AMPS DC	Shurt	3 1/2
0-50 AMPS DC	McClun	3 1/2
0-100 AMPS DC	McClun	3 1/2
0-15 Volts AC	GE	3 1/2
Time Meter	115 V 60 cy	5.85
Meter Multiplier 2.5 MEG	2 1/2"	5.85
2,500V Simpson No. 25		2.50

SPECIALS

80,80 KC Crystal in Holder		\$ 1.90
FM-6		1.35
200 KC Crystal in Holder		1.35
CD-501A Cord Part of SCR284		
Connects BC-654 Transceiver to GN-45 Generator		1.99
Fuse Post		.05
Binding Posts		.05
T-17 Microphone Used Excellent Condition		1.00
T-48 Single Carbon Button-cord with PL-68		3.50
Bearing Control Unit for 80-9 Radar Type CAGE-23A1J		14.95

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Output—40 Watt Primary 5500 Ohms plus/minus 15% at 60 Cycle. Re-lected Impedance with 500 Ohm. Resistor Across 2 1/2 & 6 Terminals \$1.95.
115 V 60 cycle 275/363 KVA Secondary 1000/500-6.3/2.5 \$7.95.

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24 VDC Solenoid Operates Two Micro Switches \$1.40.
40 VDC 3 PST 2 Norm. Open 1 Norm. Closed Cont. 115V 10 Amp. Coil 1000 Ohm 75C.
115 VAC 60 cy. DPST Guardian \$9c.
110 VAC DPDT RF Antenna Change-over \$3.50.
115 VAC DPST Cont. 115 VAC 30 Amp. Str's Dunn. 84B ex 103 2.45
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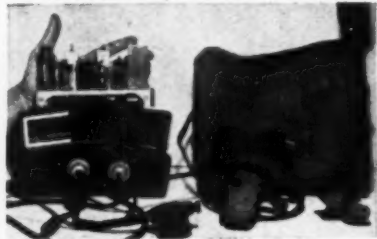
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May, 1949

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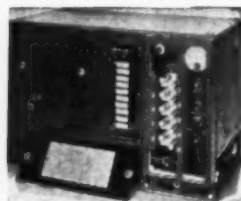
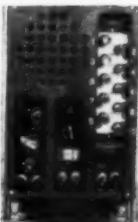
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Navy Model "M" series, 2.3 mc to 4.5 mc crystal controlled reo-transmitter. Ideal for hams, forest service, foreign, etc. Uses 7 peanut tubes and ordinary dry batteries that fit into same case. Weight less batteries, 6 lbs. With all tubes, mike, headset, antenna, bag, diagram and 2 crystals. LIKE NEW, 2 for \$58.00, Each..... \$29.95

20 to 28 MC FM RECEIVER BC-603 for 11 meters; can be tuned to 10 meters with slight modification; superhet, BFO, squeezer; 10 push-buttons and manual tuning. Makes 10 meter converter or IF strip for 88-108 MC wide-band FM; with all tubes, speaker, case, diagram. **FREE CONVERSION INSTRUCTIONS.**

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DYNAMOTOR DM-34, 12 V input for above..... \$3.00



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BC-604 TRANSMITTER 27 to 38.9 MC; 30 watt 10 channel (as above); with covers, tubes, meter, diagram; less crystals and drawer.
U-1 with dynamotor \$34.95 Without dyn. \$32.95
U-2 with dynamotor 29.95 Without dyn. 27.95

PLUG, Cannon female fits into any of above FM sets. Does away with Mounting FT-237.
N-1..... \$2.45

BC-659 and BC-620 ACCESSORIES. VIBRATOR POWER SUPPLY PE-120, operates from 6, 12 or 24 volts depending on vibrator. With 12 or 24 v. vibrator, battery cable & plug. **UNUSED \$12.95**
U-2..... \$9.95 Fair..... 7.95
Crystals for any channel 20 to 27.9 or 27 to 38.9 mc. each..... 1.00
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Diagram, BC-659 or BC-620..... .65
Antenna, Sectional type fits MP-48, 9 ft. U-1..... 1.95

VIBRATOR POWER SUPPLY PE-157 operates from 2v wet cell (not included) which fits inside. Output: 1.4v @ 500 ma & 125v at 50 ma or 1.4v at 350 ma & 60v at 15 ma. Case 6"x 6"x11 1/2" contains 4" speaker, vibrators, xmrs, diagram, etc. **BRAND NEW. \$12.95**
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ANTENNA SWITCH, 3PDT, extra heavy duty knife. Pore. stand-offs on base 7"x8"x1 1/2". Wt. 6 lbs. **BRAND NEW. Per doz \$12.00. Each \$1.19**
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TUNING UNIT TU-26, 200-500 kc used in BC375. Has 13 hi-voltage mica & 1 var. condenser, 2 vernier dials, 2 variometers, etc. N-1..... \$2.95
VIBRATOR, Rauland or Vokar JV-0014; "heart of PE237" for SCR 694. Six, 12 or 24 volt input. 2 1/2"x2 1/2"x5 1/2". **BRAND NEW, original cartons, each \$4.95**

N-1, new; U-1, used, excel; U-2, used, good

TERMS Postage extra. Please, minimum order \$2.00. Net Cash, 25% deposit on C.O.D.'s. **FREE LIST.**

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MARS Station of the Month

HHEADQUARTERS, Airways and Air Communications Service, a support organization of the Military Air Transport Service, station K3FMC was named "MARS Station of the Month" by Major Rawleigh H. Ralls, Chief, MARS, Air Force.

The station is too new to have a long list of accomplishments to display, but the speed with which it was put on the air, its traffic handling activities, and its consistency of operation are indicative that the NCS for Headquarters AACS will merit this recognition in its continued operation.

Master Sergeant Arthur R. "Mac" McKinnis, W4QOC, as chief op, puts in a full day pounding brass with an occasional break to put through a 10-meter schedule to DL4 or W5 land for a personal QSO for some member of MATS staff or their families.

C.w. operation occupies 99 per cent of the time and the ultimate ambition is to be the lead station in the "Brass Pounders League" every month. At the moment K3FMC has entered the Eastern Shuttle Net on 7120 kc. at 1030 every morning. In addition to making deliveries in the Washington, D. C., area, Mac has a message box at Headquarters building, and this is generating a bit of traffic.

Organization of world-wide nets covering the far-flung outposts of Air-

ways and Air Communications Systems is waiting only on the clarification of call signs for MARS stations outside the ZI.

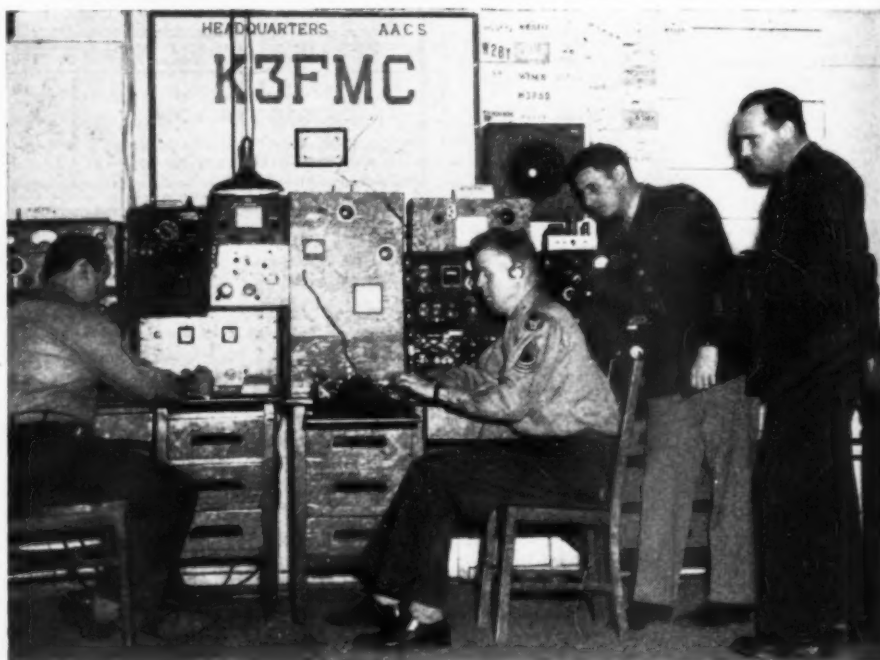
The station layout consists of an HT-4 (ancient vintage BC 610), a BC 610-E, and a home-grown peanut whistle for 40-meter operation exclusively. The HT-4 has been modified for 10-meters and is v.f.o. through the courtesy of T/Sgt. Leonard Finkle, ex-KL7FY, who built it out of surplus Navy gear. The 610-E is used for 20 and 80-meter operation in most part and is resorted to on 40 meters only when things are especially rough.

The pet transmitter is the one that Mac put together in the fall of 1945 using a BC 375 and one of its tuning units for chassis and cabinet. The v.f.o. uses a 6G6G oscillator and a 6V6 isolation stage. A VR-150 is used for voltage regulation. The transmitter proper uses a 6V6 doubler, a 6V6 buffer, which is keyed in the cathode, into an 807 with about 60 watts input. Mac feels the same way about shooting squirrels with a shotgun that he does about using more than 100 watts on 40-meter c.w.

The receiver complement consists of two SX 28s, two Super-Pros, a BC 342 and an Echophone.

Antennas really sprout from the shack. A 3-element close spaced,

Lt. James B. Bartlett (K3FMC), trustee, and Lt. (j.g.) Richard F. Thorpe observing message handling at K3FMC. L. to R.: M/Sgt. Alois M. Palenchar (W40WG) shown completing radio telephone contact; M/Sgt. Arthur R. McKinnis (W4QOC) copying traffic from W2MRL; Lts. Bartlett and Thorpe. Sgt. McKinnis is a non-commissioned officer in charge of K3FMC, Airways and Air Communications Service's amateur radio station.



which is rotated by hand, is fed with a 600-ohm open wire line and is delta matched into the driven element because the owner of same did not want it cut in two. There is a 10-meter and 20-meter doublet, each fed with coax, an end fed 40-meter full wave, and a center fed Zepp cut for 80 meters that works well on all bands.

Unification of the services is exemplified in the operation of K3FMC with Lt. (j.g.) Richard F. Thorpe, W3PHB, at the key or on the horn, evenings and week ends. Lt. Thorpe is an instrument flying instructor at Anacostia Naval Air Station during the day.

Master Sergeant Alois Palenchar, W4OWG, as second op, spends as much time as his duties will permit, sometimes indulging in two-band operation or giving the first op a break. His ear is always cocked for VK2's since his XYL hails from Melbourne.

Lt. James B. Bartlett is station trustee for K3FMC and has also been appointed as MARS director for Headquarters, Airways and Air Communications Service.

The majority of the 200 odd QSO's per month are traffic handling or rag chews with DX holding only a small allure. The Gang at K3FMC say QRU? and are always happy to QSP.

-30-

EUROPEAN TELEVISION FACILITIES

A RECENT London news item reports that only one country on the Continent (excluding Britain) can boast of television service at present. France is operating a 425 line transmission from the Eiffel Tower in Paris, and two additional French stations, operating with 819 lines, are being proposed. It will be a year or more before these are ready, however, and for the time being, no other Continental country has ordered any TV transmitting equipment, nor have any of them decided on the number of lines they will use. . . . K.B.

ANNUAL S. T. E. N. CONVENTION

THE ANNUAL convention of the South Texas Emergency Net, largest emergency net in the world, will be held in Cuero, Texas, again this year, May 28 and 29. This is a real hamfest with emphasis on emergency and net operation. Attendance last year numbered between 400 and 500, and all OM's, XYL's, and others interested are invited to this year's celebration.

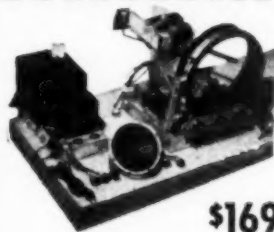
On both days, there will be entertainment as well as technical information, interspersed with lively contests and prize drawings. On Saturday, May 28, there will be a special mobile contest on the way to the convention, beginning at 7:00 a.m., in which as many stations as possible will be worked.

Besides the regular program, it has been arranged to have the FCC inspector present, and those who want to take their amateur license exams may do so on Saturday.

Contact B. B. Thorn, W5CIX, Cuero, Texas, for information, or tickets to the convention, which are \$2.50 each.

-30-

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FOR 12" TUBE
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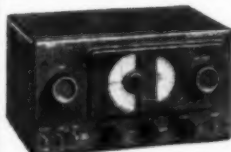
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RADAR RECEIVERS—BC-733D 10 Tubes 108-
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DYNAMOTORS—101-C. Input 13/26 v. 12.6/6.3
amp. DC Output 400v. @ .135 Amp., 800v.
.020 Amp. AC Output 9v., 1.12 amp..... 2.95
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TUNING UNIT (1st I.F.) 244C/241M..... .95
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plated, No. 1, 251 mmf; 2, 253; 3, 253; 4,
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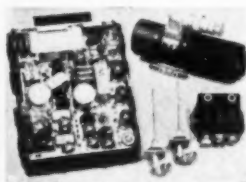


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2 1/2" diameter\$1.25
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807	1.00	5R4G	.75	6AC7	.90
2J22	12.00	C6J	10.00	931A	3.50
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2" GE 30V DC..... 2.25					

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International Short-Wave (Continued from page 58)

According to Nattugglan, Sweden, reports to Karachi should be addressed to Z. A. Bokhart, Esq., Controller of Broadcasting, *Radio Pakistan*, Mohammed Ali Jinnah Road, Karachi, Pakistan. The Swedish publication reports the 6,070 outlet is heard in Sweden 2130-2210, with news at start.

Radio Australia reports that the Dacca station is eager to receive reception reports, especially from distant points, and that the QRA is simply *Radio Pakistan*, Dacca, East Bengal, Pakistan.

Finally, here are a few brief background notes on Pakistan that may add to your enjoyment of its radio broadcasts:

The new Dominion of Pakistan comprises two zones a thousand miles apart, embracing portions of a number of predominantly Moslem provinces in the northwest and northeast corners of India and a number of Princely (native) States. The zones are connected by sea, air, and radio-telephone links. The area is approximately 361,000 square miles, and the population is upwards of 70 million. Pakistan consists of four provinces—East Bengal, capital Dacca; North West Frontier province, capital Peshawar; West Punjab, capital Lahore; and Sind, capital Karachi.

Karachi, the nation's capital, is a seaport and is an important airline junction as well, having the largest airport in all Asia. It is the seat of the Sind University.

The national flag of Pakistan is green and white; the white portion, which is one quarter of the flag, stands for the non-Moslem minorities; on the green part appears a white crescent and heraldic star.

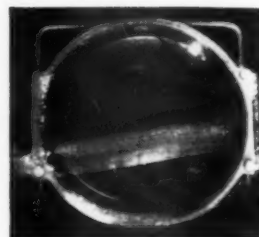
As you probably know, Pakistan is essentially agricultural, chief crops being jute, cotton, wheat, and rice; in fact, the Dominion is the largest producer of jute fiber in the world. Tea and oil seeds are exported in quantity. A geological survey—now under way—has already revealed the existence of rich deposits of oil, coal, sulphur, salt, lime, chromite, asbestos, anti-mony, steatite, and gypsum.

Eastern Bengal was over-run by the Moslems at the end of the 12th century. It is a land of rivers, tributaries of the Ganges and the Brahmaputra. These serve as highways, and bring down the alluvial soil which makes it one of the most fertile countries in the world. It has a good seaport in Chittagong. Its products include tea, indigo, jute, timber, and many kinds of grain.

Pakistan was accepted as the 57th member of the *United Nations* on September 30, 1947.

As we take our leave of radio in the new Dominion of Pakistan, it is with a feeling that already the Dominion is

Magnify Your Profits!



Buy direct from one of the largest Manufacturers of magnifiers for Television sets.

Our freeblown magnifier lens gives undistorted magnification at a wide angle. Available in clear or light blue. With universal bracket providing adjustment up or down—in or out. Fits any set on the market.

Standard lens with bracket for 10" tube, retails for... **23.95**

Standard lens with bracket for 7" tube, retails for... **19.95**

Both sizes available at slightly less with metal strap hangers designed for particular sets.

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RADIO & TELEVISION NEWS

well under way with its program for providing radio facilities—both for domestic and foreign consumption. Our hearty congratulations and best wishes for the future go this month to *Radio Pakistan!*

Verification Data

QRA for Tashkent is Radio Taschkent Broadcasting Commity, Taschkent, USSR. (Nattugglan, Sweden)

COCQ may be addressed in care of CMQ Network, Inc., Radio Center, Havana, Cuba. (Bachman, Pa.)

Here are a few current QRA's from Sidney Pearce, England—Foreign Broadcast Section, Radio Indonesia, Koningsplein Zuid 17, Batavia C., Java, D.E.I.; Forces Broadcasting Station, Station Commander, No. 4, Cyprus M.E.L.F. 3; JJOY, Grecian District, Office of the District Engineer, Corps of Engineers, Athens, Greece; YUM, Station Director, No. 15, Marshall Road, Egmore, Madras, India; Emissora Nacional, Rua do Quelhas, Lisbon, Portugal.

Radio Hong Kong, Hong Kong Broadcasting Studios, Hong Kong, has written Gaynor, Calif., thanking him for his reception report; stated "It was very welcome, as we don't often get a report from America. I'm afraid that we don't send out verification cards—we are a Government department, and the expenditure has not yet been approved. However, we enclose a schedule of our times of transmission, etc." The letter was signed by D. Keith Hardy, Program Secretary.

Address for XGT-2 series is Chinese Govt. Radio Admin., Sasson House, Tienchil Road, Shanghai, China. (Gaynor, Calif.)

Club Notes

Sweden—Nattugglan, "Night Owl," house organ of the Scandinavian DX-Club, is available to overseas club members for 20 IRC's for a whole year, 10 IRC's for a half year; QRA is Box 563, Jonkoping 2, Sweden. President of this fine organization is Karl-Ake Bergstrom; editor of *Nattugglan* is Viggo Bengtsson.

United States—Walt Morgan, Pa., informs me that the World-Wide DX Society has merged with the Dial Spinner's Club under the latter's name. Publishes a monthly bulletin.

This Month's Schedules

(NOTE: Some stations are now changing to Summer Time, in which cases schedules may be one hour earlier than listed herein.—K.R.B.)

Albania—Nattugglan, Sweden, lists Scutari on 8.220 at 2330-0100, 1300-1630, says at 1300-1400 has own program, but after 1400 relays ZAA, Tirana. It lists *Radio Korce* on 6.280 with weekday schedule of 0045-0200, 0530-1200, and Sundays 0630-0715, 1145-1505.

ZAA, 7.852, Tirana, heard in Newfoundland 1500-1630; *English* 1515-1530. (Peddle)

Algeria—Radio Algiers, 9.570, heard well lately in Arabic before 1445-1530 and French from 1530 to sign-off 1800.

May, 1949

YOUR BEST VALUE

IS IRC POWER WIRE WOUNDS

By any comparison, IRC is your biggest value in Power Wire Wound Resistors. Examine the *extra* features you get with these dependable IRC heavy duty resistors.

The exclusive moisture-proof coating is designed to the known scientific principle that a dark, coarse surface dissipates more heat more rapidly than a smooth, shiny surface. This means better performance.

For easier installation, IRC provides both lead and lug on the same terminal. Lugs may be clipped for space saving in crowded chassis, and heavy tin dipping assures easy soldering. Resistor ends are clean and free of coating—permitting easy vertical mounting with tie-bolts. Bracket mountings are available for larger power wire wound types. Clear identification of type and range on every IRC Power Wire Wound is permanent . . . for easy, accurate replacement.

And here's a feature that should not be taken for granted—IRC Power Wire Wounds *handle full rated power*. No derating is required at high ranges.

When you buy power wire wound resistors, always ask your distributor for IRC—most for your money by any comparison. International Resistance Co., 401 N. Broad Street, Philadelphia 8, Pa. *In Canada:* International Resistance Co., Ltd., Toronto, Licensee.

INTERNATIONAL RESISTANCE CO.

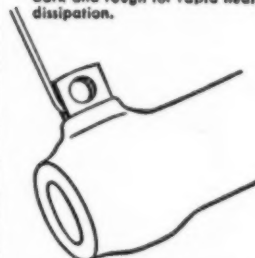
Wherever the Circuit Says ~~~~



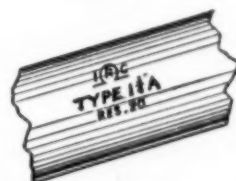
fixed and adjustable types in wide range of ratings, sizes and terminal types.



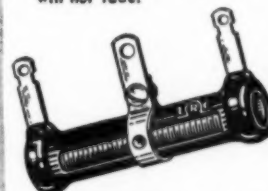
COMPARE THE COATING
dark and rough for rapid heat dissipation.



COMPARE THE TERMINALS
both lead and lug on same heavily tinned terminal.



COMPARE IDENTIFICATION
permanent marking shows type, size and resistance—will not fade.



COMPARE PERFORMANCE
IRC PWW's handle full rated power—no derating required at high ranges.



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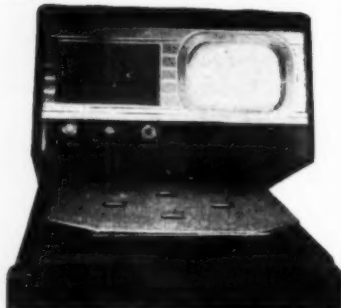
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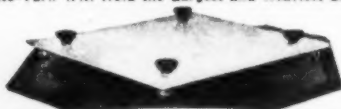


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Tele-Turn is also adaptable for use under heavy ham equipment.

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(Hagen, Ala.) Heard testing on 11.836 at 1145-1230. (Swedish DX)

Anglo-Egyptian Sudan—Omdurman is still heard on approximately 9.750 during Arabic session 1400-1430; call of "Huna Omdurman" is clear and distinct. (Pearce, England) Other British listeners report this channel audible in England 1130-1300, 1400-1430. Only English is Fridays 1230-1300. (Swedish DX)

Angola—CR6RL, 8.090, Luanda, heard 1330-1600 sign-off, same for CR6RA, 9.470. (Peddle, Newfoundland)

Argentina—LRS, 9.315, Buenos Aires, heard 1730-2100; LRU, 15.290, heard 1515-1600. (Peddle, Newfoundland) LRY-1, 9.545, heard 0515 with Spanish news. (Alfred, Ontario)

Australia—Recent schedule alterations of *Radio Australia* effected these current listings—at 0900-0945, VLA6, 15.200, to N. Asia, British Isles and Europe, while VLC11, 15.21, is used to S. Asia, British Isles and Europe; 0900-1000, VLB3, 11.76, to S. Asia, British Isles and Europe, and same time, VLG3, 11.71, to same areas. At 1000-1115, VLA6, 15.20, to North America (West Coast), VLC3, 11.76, to same area, VLG3, 11.71, to S. Asia; at 1015-1115, VLB9, 9.615, to Africa. At 1500-1655, VLC (dependent on BBC monitoring report for clear channel, may be one of 15.16, 15.21, or 15.22), to British Isles and Europe; 1710-1815, VLC9, 17.84, to South America; other schedules remain as previously listed. (Hutchins)

Graham Hutchins, DX Editor of *Radio Australia*, has airmailed me complete current schedules of the Inland Short-Wave Service of the Australian

Broadcasting Commission. **Melbourne**—VLG6, 15.23, Sunday through Friday 1500-1700, Saturday 1545-1700; VLR2, 6.15, Sunday through Friday 1500-1715, Saturday 1545-1715, Monday through Friday 0345-0830, Saturday 0345-0900, and Sunday 0230-0830; VLR, 9.54, Sunday through Friday 1730-0330 (next day), and Saturday 1730-0215 (next day); VLH4, 11.88, Sunday through Friday 1500-1815, Saturday 1545-1815; VLH5, 15.23, daily 1830-0315 (next day); VLH3, 9.58, Sunday through Friday 0328-0830, Saturday 0328-0900. **Sydney**—VLI2, 6.09, Sunday through Friday 1500-1745, Saturday 1545-1730, Sunday through Friday 0330-0830, Saturday 0330-0900; VLI3, 9.50, Sunday through Friday 1800-0315 (next day), and Saturday 1745-0315 (next day). **Brisbane**—VLQ3, 9.66, Sunday through Thursday 1500-0830 (next day), Friday 1500-0900 (next day), and Saturday 1545-0830 (next day). **Perth**—VLW3, 11.83, daily 1930-0300 (next day); VLW5, 9.61, Sunday through Friday 1700-2115, Saturday 1745-2115, and Sunday through Friday 0515-1030, Saturdays 0515-1100.

Port Moresby (Br. New Guinea)—VLT5, 7.28, Sunday through Thursday 1545-1900, Friday 1545-1730, Saturday 1645-2000, Monday through Friday 0315-0730, Saturday 0315-0800, Sunday 0315-0700; VLT7, 9.52, Sunday through Friday 2100-2300, Saturday 2100-0300 (next day), Monday through Friday 0030-0300, and Sunday 0100-0300.

VLI3, 9.50, Sydney, N.S.W., heard in California after XEWW, Mexico City, leaves this channel 0100; is best 0230. (Balbi)

(Continued on page 159)

LEAD-IN FASTENING TO TELEVISION ANTENNA

By MATTHEW MANDL

THE place where the twin-lead or coaxial cable fastens to the terminal posts of the antenna should never be the means of support for the weight of the transmission line. When the line is not pulled tight, the combined weight of the lead-in and the constant flexing of the connection receives during windy days, will break the connection.

Even if it is desired to run the lead-in well away from the supporting mast in order to minimize losses, an extra fastening should be made eight or ten inches below the antenna to support the lead-in weight and prevent flexing of the lead-in at the terminal joints. This may be accomplished by use of the metal stand-off insulator with the polystyrene insert as shown in Fig. 1.

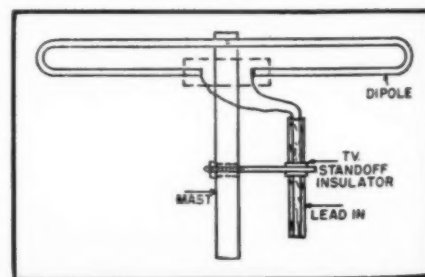
A hole is drilled through the supporting mast so that the insulator can be bolted on. If the insulator end is of the wood screw type, a slightly smaller drill can be used so that the insulator will partially make its own thread as it is turned into place. With the twin-lead type, a pair of pliers can be used to press the loop tightly around the insert. This forces the slot closed and holds the twin-lead rigidly. A thin hole can also be punched exactly in the center of the twin-lead insulation, one above the stand-off insulator, and one below.

Thin string can then be pulled through the holes and tied around the insulator to prevent movement of the twin lead through the slot.

With the coaxial-type line, a stand-off insulator made for the coaxial is used. Two pieces of size 14 wire are looped around the coaxial above and below the insulator, and twisted tightly so that the line cannot shift down and exert a strain on the terminals at the antenna. Inasmuch as the outer conductor of the coaxial is at ground potential and covered with insulation, the twisted wire around it will not alter its characteristics.

—30—

Fig. 1.



RADIO & TELEVISION NEWS

10.7 mc. Discriminator

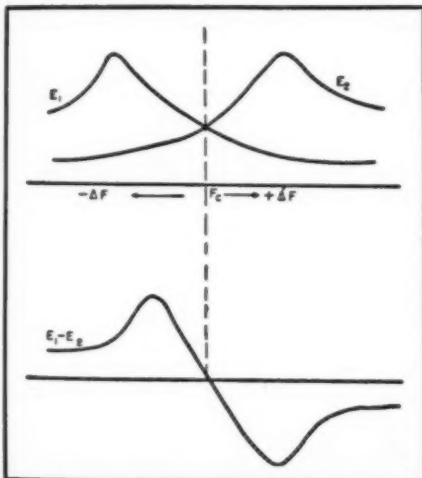
(Continued from page 59)

across the resistors R_1 and R_2 and thus produce a voltage difference across "a". "c." This is illustrated in Fig. 3, which shows how the magnitudes of the resultant voltages vary with deviations in the applied signal frequency from the center frequency, F_c . The difference voltage, $E_1 - E_2$, is also shown in Fig. 3 and gives the net potential developed across the output of the discriminator; such a curve is known as the *discriminator characteristic*. The greater the phase shift between the two component voltages supplied to each diode, the greater will be the net output voltage. Thus frequency variations can be transformed into voltage variations which are not only proportional to the frequency deviation, but which vary in polarity with the side of the center frequency to which the frequency deviation occurs. The result is an audio signal conforming to the modulating voltage applied to the carrier frequency.

The proper functioning of the discriminator circuit depends chiefly upon the linearity of the load resistors R_1 and R_2 , similar diodes, and a well designed discriminator transformer. The first two requirements are easily met, and suggestions for building the third are given in the following specifications.

Fig. 1 shows the essential parts and the completed assembly of the easily built transformer. The type of coil form and shield-can shown are desirable but not absolutely essential; any adaptation of discarded i.f. transformer forms may be employed as long as the coil diameter and spacings as shown in Fig. 4 are closely followed. Also, the metallic shield should be of a size to permit at least the width of one coil diameter between the windings and the shield, both at the sides and the ends of the coils. Since the symmetrical placement of the secondary winding with respect to the primary winding prevents the use of inductive tuning, capacitive tuning is

Fig. 3. Derivation of discriminator characteristic as referred to in text.



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3" P.M.—1.47 oz. Alnico V.....	1.15
4" P.M.—1.47 oz. Alnico V.....	1.15
4"x6" P.M.—Alnico V.....	1.69
5" P.M.—1 oz. Alnico V.....	.99
5" P.M.—1.47 oz. Alnico V.....	1.15
8" P.M.—2.15 oz. Alnico V.....	2.75
8" P.M.—4.64 oz. Alnico V Magnet.....	2.95
8" P.M.—6.8 oz. Alnico V.....	3.69
10" P.M.—6.8 oz. Alnico V.....	3.75
12" P.M.—Alnico V.....	3.95
12" P.M.—6.8 oz. Alnico V RCA.....	4.95

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12" P.M.—21 oz. magnet with 6V6 P.P. output, cord and plug.....	\$5.95
12" 1000 ohms field with 6V6 P.P. output, cord and plug.....	5.95
12" 680 ohms field with 6V6 P.P. output, cord and plug.....	5.95
8" 680 ohms field with 6V6 P.P. output, cord and plug.....	3.69

TOGGLE SWITCH—Bat Handle, Long Shank Single-pole double-throw—3 amps.....25c

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1A3	45	39	6U7G	35	25
1A5GT	35	49	6V5GT	59	49
1C5GT	69	59	6V6GT/G	45	39
1C7G	64	58	6W4GT	69	59
1D5G	67	60	6X5GT/G	49	39
1D7G	69	59	6Y6G	71	63
1F7	79	69	7A4	59	49
1LC8	69	59	7A7	49	44
1LD5	69	59	7B6	49	44
1LN4	69	59	7B7	49	44
1LN5	69	59	7B8	69	59
1L4	49	45	7C5	55	49
1P5	59	49	7C6	49	44
1R4	69	59	7H2	49	44
1R5	55	49	7K7	49	44
1S5	58	48	7Q7	69	59
1T4	69	55	7X7 (XXFM)	44	35
1T5GT	59	49	7Y4	44	35
1U4	49	39	12A	79	69
1V	45	39	12AB	25	25
2A7	32	25	12ABGT	35	28
2E5	89	79	12AT6	50	45
2X2/579	35	29	12AU6	65	55
8A4	49	39	12AV6	49	39
3B7/1291	59	49	12BA6	50	45
3Q5	55	49	12BE6	45	45
3S4	55	45	12H6	39	34
3V4	79	69	12J7GT	45	39
5U4G	50	40	12K8Y	35	29
5W4GT	39	34	12Q7GT	45	39
5Y3G	42	37	12SA7GT/G	40	32
5Y3GT/G	40	33	12SF5GT	40	32
5Y4G	39	32	12SJ7GT	55	49
5Z3	59	49	12SK7GT/G	45	35
5Z4	59	49	12SL7GT	49	43
6AB5/6N5	99	89	12SN7GT	49	43
6AC5	69	59	12SQ7GT/G	40	32
6AC7/1852	79	69	12SR7	35	32
6AH6	49	39	12Z3	55	49
6AL7	69	59	14A7	65	55
6AN5	65	55	14B6	59	49
6AT6	49	39	14Q7	65	55
6B4G	89	79	19T8	89	79
6BA6	49	39	24A	49	39
6BE6	49	38	25L6GT	55	45
6BG6G	99	89	25Z6GT/G	45	39
6BH6	79	69	26	32	25
6BJ6	59	49	27	45	35
6CA	29	25	32L7GT	52	48
6C5GT	40	35	35L6GT/G	45	39
6D6	49	45	35W4	43	40
6F5GT	55	45	35Y4	43	40
6F6GT	45	39	35Z4GT	49	45
6F7/VT70	39	29	35Z5GT/G	43	39
6G6G	59	49	35Z6G	43	39
6M6GT/G	45	36	35/51	42	37
6J7GT	42	38	36	35	29
6K6GT/G	45	39	39/44	25	19
6K7G	50	41	43	54	47
6K7GT/G	49	39	45	49	39
6K8	69	59	45Z5	59	49
6L5G	69	59	47	49	39
6L6G	93	84	50	149	99
6N4	49	38	50B5	42	32
6P5GT	55	49	50L6GT	50	45
6Q7G	51	47	56	55	45
6SA7GT/G	44	37	57	45	39
6SD7	49	39	58	55	45
6SH7GT	40	32	75	59	49
6SK7GT/G	49	39	76	49	45
6SL7GT	49	47	77	35	27
6SN7GT	49	47	78	49	39
6SQ7GT/G	44	37	80	40	38
6SR7	43	36	81	149	99
6SS7	59	49	85	49	45
6SV7	55	49	99V	35	25
6T8	89	79	99X	35	25
6U5/6G5	69	59	117Z6GT/G	79	69

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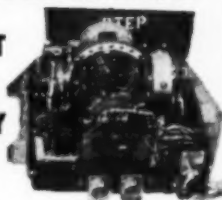
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This outstanding receptor now offers even finer performance, truer tone, more stability—the result of new design changes and the exclusive use, wherever possible, of ceramic components.

Designed for simple connection to present AM radio receivers, the 8C instantly converts them to standard AM or thrilling, static-free, high fidelity FM reception.

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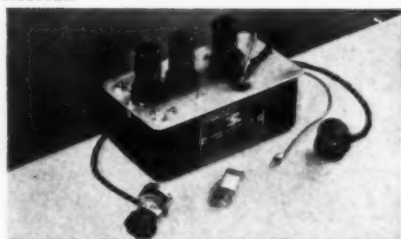
See and hear the new 8C Receptor at your Meissner Jobber.

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MEISSNER MANUFACTURING DIVISION
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with your present Radio-Phonograph or Amplifier on both Standard and Long-Playing Records.



Reduces scratch and rumble without fixed loss of "highs" or "lows".

Add realism to your music reproduction by these 2 simple steps.

1. Plug in the "Little Wonder" *Dynamic Noise Suppressor between your pick-up and amplifier.
2. Plug in the socket adapter to the power-tube socket.

The "Little Wonder" (Type 110-A) realizes the full capabilities of your present equipment; remote control mounts anywhere; high-and-low-frequency noise suppression; two inductor type high-frequency gate circuit; two separate control rectifiers; compact — 7 x 3 3/4 x 4 3/4 inches. For full specifications write for bulletin 549 RN-1.

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IMPROVE PICTURE QUALITY! Heavy blue tinted acetate, EASILY ATTACHED—A MUST for complete TV enjoyment.

For 7" tubes... \$.75 For 15" tubes... \$1.89
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(Sonotone Vacuum Tube type). Make a real VEST POCKET RADIO or AMPLIFIER, adding only small tuner & speaker or phone. Ready-wired miniature components including 2 controls, output trans, choke, switch, resistors, condensers, etc. Overall only: 2"x1/2"x5"—WEIGHS ONLY 3 1/2 ozs. Less tubes & case. COMPLETE WITH DIAGRAMS FOR 3 or 3 TUBE SET. NOW ONLY

GENERATOR VOLTAGE REGULATOR (GE)—Navy type GBD-1-A-18. Contains valuable 24 stepped contact 24V adj. relay, ass'd, resistors, plugs, sockets, shock mounts, etc. Shpg. wt. 4 lbs. A STEAL AT... \$1.49
SELENIUM RECTIFIERS—F.W. bridge, 18V, AC input @ 1/2 amp. cont. 3/4"x3 1/4"... 98c
1/2 Wave, 54V, AC input @ 1 amp. 1 1/4"x... \$2.49
1/2"—ea. 69c; 4 for...

"KIT OF THE YEAR"

LEOTONE'S JUMBO RADIO PARTS KIT "NEVER A BETTER BUY—MOST FOR MY MONEY" says Radioman James E. Riley of West Chester, Pa. That's what they're all saying about this gigantic assortment of new & dismantled Radio & Electronic parts—17 FULL POUNDS OF COILS, SOCKETS, WIRE, SPEAKER ACCESSORIES, TRANSFORMERS, RESISTORS, CHASSIS. ALL THESE (shpg. wt. 21 lbs.) AND MUCH MORE FOR ONLY... \$249

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FOR CONSOLE CHANGERS, RECORDERS, TRANSMITTER RACKS, DRAWERS OF EVERY TYPE. Sturdy steel & aluminum; ball-bearing action. Shpg. wt. 2 lbs. 9" extension (13" overall)... \$1.89 pair
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Hvy. duty, all-steel, 12 1/2"/16 1/2"... 2.75 pair

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ARMY FIELD WIRE (W-110)
All-purpose twisted pair for Radio, Telephone or Bell Wiring. Impregnated cotton & rubber 7 strand steel & copper. Available only in coils, 300 to 450 ft. Specify min./max. length desired. Shpg. wt. 4 lbs./100 ft. WHILE IT LASTS! 1/C per 1/2 ft.

Min. order \$2.00—20% Deposit on all C.O.D.'s. Please add sufficient postage—excess refunded.

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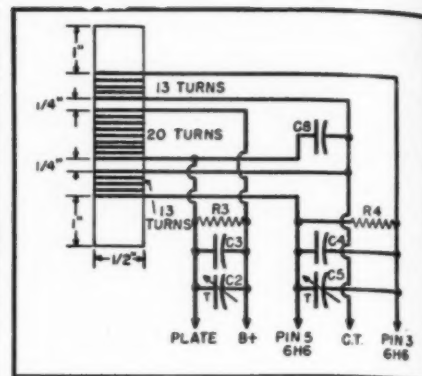
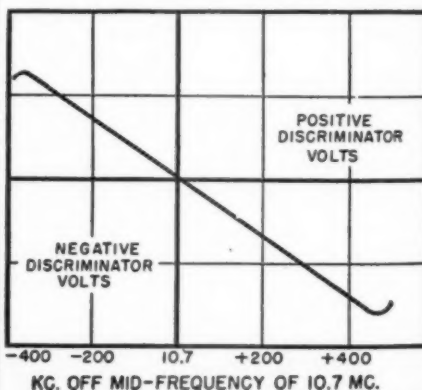


Fig. 4. Winding specifications and wiring details of the discriminator transformer.

used. Since it is desirable to use variable air condensers for better stability, this requirement limits the tuning range since it is also well to make these tuning condensers as small as is physically possible so that they can be made an integral part of the discriminator transformer assembly. However, the condensers used in this transformer, though small physically and capacitively, have ample tuning range to adjust the resonant conditions of the transformer properly.

The winding data is given in Fig. 4. The primary winding consists of 20 turns of #29 double nylon covered copper wire (#29 D.C.C. may be used as well) close wound. The secondary consists of two windings of 13 turns of #29 D.N.C. close wound, one winding being displaced 1/4 inch above and the other displaced 1/4 inch below the secondary winding. All windings are wound in the same direction, with the common center tap ends of the secondary winding placed closest to the primary winding. The fixed capacitance of the primary circuit is 30 μ fd.; while that of the secondary circuit is 40 μ fd. Midget micamolds were used to conserve space. The variable tuning condensers are Underwood silver-plated 15 μ fd. variable air condensers, that of the primary being placed at the bottom of the transformer form and that of the secondary at the top of the form. The windings are held in place by applying a thin coat of liquid polystyrene coil dope. The 10,000 ohm damping resistors and the 50 μ fd.

Fig. 5. Discriminator characteristic.



RADIO & TELEVISION NEWS

coupling condenser are mounted within the transformer shield.

The frequency discriminator characteristic curve is shown in Fig. 5. The data for such a curve may be obtained by means of an unmodulated variable frequency oscillator, a vacuum tube voltmeter and a discriminator circuit as shown in Fig. 1. The data for the characteristic shown in Fig. 5 was actually obtained by using a Model 900 Vomax and a surplus Signal Corps signal generator I-222-A. Using such equipment with an input of 0.05 volts the maximum discriminator output voltage was about \pm one volt. In order to have a correctly operating discriminator, the characteristic curve shown in Fig. 5 should be obtained. The i.f. frequency of 10.7 mc. should be applied to the grid of the last limiter stage and the output of the discriminator measured across the diode load resistors (points "a"- "c" in Fig. 2) by means of a vacuum tube voltmeter. There should be a zero voltage output when the input frequency is exactly 10.7 mc. As the input frequency at constant voltage is varied positively and negatively with respect to the center frequency of 10.7 mc. the output voltage should vary linearly as shown by the characteristic in Fig. 5. If the output voltage is not zero at 10.7 mc. then the transformer secondary tuning condenser, C_s , should be adjusted until this condition is met. The linearity of the characteristic is adjusted by means of the transformer primary tuning condenser, C_p .

DUST IN PROJECTION TELEVISION RECEIVERS

BY MATTHEW MANDL

TELEVISION receivers using the direct projection method or the modified Schmidt system, are prone to gather a considerable amount of dust on lenses and picture tube faces, with the result that brilliancy is reduced to a considerable degree. Unless the entire unit is hermetically sealed, dust will get through the various small crevices and holes in the projection system housing. The television serviceman is usually surprised when he inspects such sets after a half year's use, to find how much dust has actually accumulated within the "barrel" which houses the spherical mirror, the tube, and correcting lens.

When projection sets are serviced, a complete check should be made of all glass or mirrored surfaces involving the projection system. A successive accumulation of dust on all the components of the system all add up to produce a marked reduction in picture brilliance. The corrector lens, the reflecting mirror, the face of the projection tube, the viewing screen, or any other part that has to do with the projected function of the picture, should be first dusted off with a soft, dry cloth so that the abrasive characteristics of the dust will not injure the highly mirrored or polished surfaces. A chamois, soaked in warm water and wrung nearly dry should then be used to clean the surfaces thoroughly.

-30-



HEAR AND TRY **BEFORE YOU BUY**
Visit Sun Radio's sensational 1000 ft. "Self-Service" Sound & Television Studio.



SUN RADIO 10 W. HI-FI AMPLIFIER KIT!
From design published by Consumers Research, Inc. of Washington, N. J.
Build this high-quality all-triode, self-biased, High-Fidelity amplifier for much less than you'd expect to pay! Kit composed and chassis punched in accordance with the design published by Consumers Research, Inc. of Washington, N. J., in Special Bulletin 31. Compare these specifications! • Freq. Response: 20-15,000 c.p.s. \pm 1 db • Built-in preamplifier and equalizer for use with magnetic cartridges. • Individual bass & treble electronic tone control circuits. • Hum level is 60-70 db below rated output at radio input. • Distortion: less than 2.5% at 10 watts; 2.5% at mid-frequencies at 11.8 watts. • Gain: radio, 75 db; phono, 97 db; magnetic pickup, 117 db. • Tubes: 6SC7, 6J5, 2-6SN7, 2-6B4G, 5U4G. • Complete with all 7 RCA tubes, components, punched chassis, hardware, etc., and easy step-by-step instructions. Great buy! Order now!
Triode Kit, Model CR-10, complete \$42.50
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NEW WEBSTER 3-SPEED CHANGER

Terrific! Plays standard (78 rpm), LP (33-1/3), and RCA (45) records. Beautiful tonal quality. Uses plug-in heads for use with Variable Reluctance cartridges of any make. Automatically correct stylus pressure. Instantaneous changeover to 45 rpm. Complete with 2 plug-in heads, 45 rpm spindle adaptor, hardware, and template.
Less cartridges, your cost \$25.95



"TWIN-TILT" MAGNETIC CARTRIDGE WITH 2 STYLII

Electro-Voice. 2 sapphire tips (for 78 rpm and LP) on one cartridge. Perfect for converting Webster 256-1 and other changers from xtal to High-Fidelity Variable Reluctance pickup. Both styli replaceable. Use with any preamplifier or EV #503 transducer. FREE - for limited time: 45 rpm adaptor, with purchase of "Twin-Tilt" Your cost \$7.64

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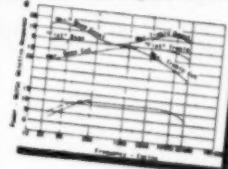
TUNERS: Meissner 8C, FM Tuner \$38.33
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Espey 512, FM-AM \$80.51
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Lower curve shows power output. (2 1/2% distortion, solid line; 5% distortion, broken line.)

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GE 1201D, 12", cone type \$17.35
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Jensen JRP-40, 12", co-axial \$19.60
University 4401 tweeter \$11.76
Univ. 4407 tweeter adapter, with #4401 tweeter, mounting cowl, etc., (shown) \$14.70

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GE SPX-040, .003 stylus, VR cartridge \$5.82
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Astatic M1-2M, .003, magnetic cart \$4.41
Astatic M1-2M-33, .001 magnetic cart \$4.41
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Styli for above, .002, .0025, .003, each \$2.40

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A sharp cut-off filter for use with magnetic pickups. Install in a few seconds. You quickly choose a maximum high frequency range for any given record to minimize noise without serious loss of music signal. Get it at Sun Radio.

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either type shown complete with wire, power supply and instructions.
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**For Those
Who Want
to Know
How**

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Proper antenna installation can do as much for a television receiver as 2 R.F. amplifiers or a special booster. And unless you get the signal into your set, even the most expensive receiver will function poorly. TELEVISION ANTENNA INSTALLATION covers every phase of installing a television antenna showing how to get the most out of every installation. Every step is clearly and simply explained so that any radio man can do the job right the first time. NO PREVIOUS EXPERIENCE NEEDED.

WORK FASTER, MAKE MORE MONEY ELIMINATE EXPENSIVE RECALLS

Here is the practical approach. Full information is given on how to choose the best antenna, how to find the right location, what mounting brackets to use, which transmission line is best, and even what tools to have. Nothing is left to your imagination. This is a book designed for the man who will do the job.

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Navy Men Open New "HAM" Station at Pearl Harbor

ONLY fifteen days after construction was started on the all-Navy "ham" station, KH6TX, at Pearl Harbor, it went on the air for the first time, September 30, 1948.

Under the guidance of Commander Ashton B. Jones, Jr., USN, of Sugar Creek, Mo., and James W. Armstrong, chief electronic technician, USN, of Windham, Ohio, the officers and men worked in their leisure hours to construct one of the most powerful amateur stations in the Hawaiian Islands. They gathered surplus and surveyed radio parts from sources in the Hono-

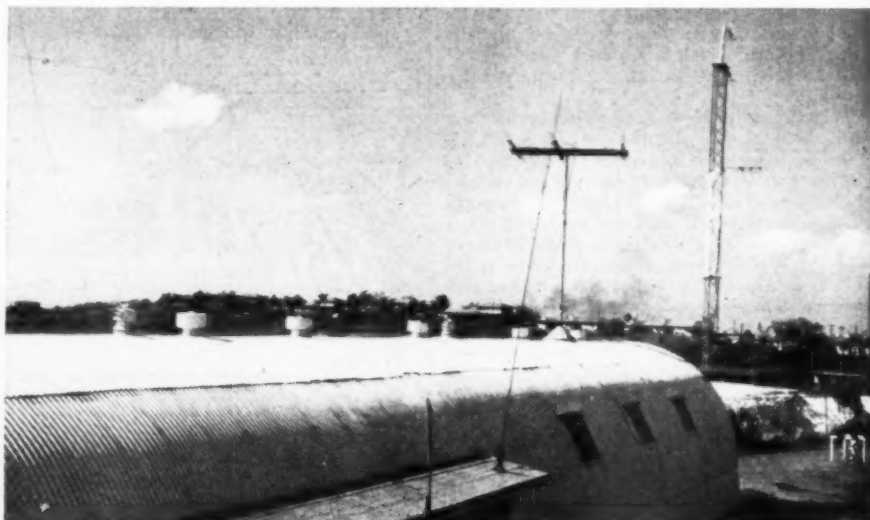
lulu area, and utilized the highly specialized Navy course in constructing and operating this popular hobby of amateur communications.

King-How-6-Tare-Xray, operating at the legal power limit of 1000 watts, is licensed in the name of Commander Jones, fleet maintenance electronics officer. Of the men at the Maintenance Unit, four are licensed operators, including Commander Jones and Chief Armstrong. The others are studying the International Morse Code in preparation for their "ham" licenses.



Officers and men of the Fleet Electronic Maintenance Unit at Pearl Harbor. These Navy electronic specialists combined their talents and leisure hours in constructing KH6TX in less than fifteen days from non-operative parts of surplus and surveyed equipment. Commander Ashton B. Jones, Jr., USN, is shown, seated, second row.

This quonset hut is the home of King-How-6-Tare-Xray, at Pearl Harbor, one of the most powerful "ham" stations in the Hawaiian Islands. The three-element rotary beam is seen in the foreground attached to the roof of the quonset hut. The other antenna, a long wire, is shown in the background, mounted on a tripod.



Chief Armstrong reported that there is no other outfit in Hawaii more powerful than KH6TX. It tries to deliver messages anywhere in the world and to arrange radio-telephone contacts between the members of the Armed Forces in that area and their families and friends back home. One bluejacket at Pearl Harbor talks regularly with his wife in Wichita, Kansas.

The so-called "home-constructed" station was made from parts that were in non-operating condition. The Navy technicians modified some parts and repaired others in forming their station, constructing two transmitters and a three-element rotary beam antenna.

Working on the 10, 20, and 40-meter bands, KH6TX, Pearl Harbor, now carries on conversations with Japan, Australia, New Zealand, the United States, Canada, and the many "hams" in the vast Trust Territory of the Pacific Islands.

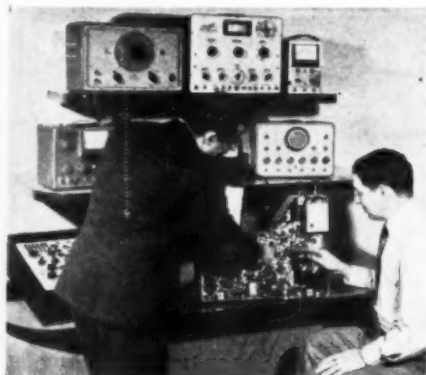
"REPS" GOPHER CHAPTER SELECTS NEW OFFICERS

THE GOPHER chapter of "The Representatives" of Radio Parts Manufacturers, in one of their recent monthly dinner pow-wows in Minneapolis, elected Jack Heimann as the new president, Fred B. Hill, vice-president, and Al Warner as secretary-treasurer.

Delegates to the "Reps" annual meeting, to be held in connection with the radio parts show in Chicago during May, were also selected. Fred Hill, a member of the Industry Relations Committee of the national group, will be delegate chairman, with Al Warner and Mel Foster supporting him. Alternates are Merrill Franklin, Herb Richardson, and Marvin Kirkeby.

The Gopher group gets together in the well-known "Hucksters" room at "Harry's Cafe" in Minneapolis on the third Monday of each month to hash over mutual problems and cooperative promotion. The Gopher motor caravan "Radio Trade Tour" last Fall was so successful that a similar program is in prospect for late this year.

Sun Radio's Burt Zimet, manager of the Sun's Test Equipment Center, is shown instructing a serviceman in the proper use of a new television signal generator at one of the fully-equipped test benches. The Center at 122-124 Duane St., New York, N. Y., displays all of the latest types of testing devices, and these are at the disposal of servicemen and dealers, who are urged to come in and try before they buy.



May, 1949

TREMENDOUS TELEVISION VALUES AT FEDERATED



Federated Antenna Towers

Get your antenna up high, and watch signal strength climb. Excellent for fringe area TV installations, hams, etc. All welded construction, with patented supports. Lightweight, but rigid and rugged to withstand severest conditions. Has a universal antenna mount. Can be used with any rotator unit. (Less antenna.)

E190 (illustrated)—20 ft. tower, 10' adj. pole in cap. Total height, 28 ft. **\$24.00**

C103—10' top section with 10' adj. pole and cap. **\$19.79**

M102—10' center section. **\$14.29**

B102—Base section. **\$5.88**

1250 ft. pkg. of 6 strand #20 guy wire. **\$3.50**

1250 ft. pkg. of deluxe heavy duty, cushion center guy wire. **\$5.40**

ICA "WASP" ANTENNA

An attractive, decorative, tabletop TV antenna. Dipoles are fixed in a swivel base for "peaking" each channel. Permits horizontal and vertical orienting, and length adjustment for desired channel tuning. Comes complete with length of 300 ohm line, equipped with plugs for insertion into jacks on antenna. Only. **\$4.17**



Federated Wave Trap

Reduces interference from FM stations. Stabilizes picture. Connects to antenna terminals on TV set. Use with any set. Terrific value. Order now. **\$1.95**



Federated Glare Filter

Reduces glare and eyestrain, improves contrast. Available in smoke or blue—specify.

7" tape adhesive **\$2c**

10" tape adhesive **66c**

10" suction cups **77c**

12" tape adhesive **\$1.15**

12" suction cups **\$1.27**



18-DRAWER EQUIPTO



STEEL SHOP CABINETS

Remarkably useful assembly, contains 18 drawers, each with 4 removable adjustable compartments. Olive green baked enamel finish. Width 34", height 13 1/2", depth 12". Cabinets may be stacked or used individually.

\$26.50

YOUR COST. **\$14.50**

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TELREX ANTENNAS

Outstanding new conical design produces better picture definition. Because of non-varying center impedance, the transmission line is terminated correctly on all frequencies, thus eliminating standing waves and ghosts, noise, etc. High front-to-back ratio. High gain on all 12 channels. Supplied less mast. Rapid installation.



Model 4X-TV—Double-stacked. **\$42.50**

Model 2X-TV—Single unit. **\$20.50**

12 ft. Dural Mast. each **4.80**

ALLIANCE "TENNA-ROTOR"

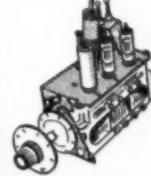
Rotates your antenna 365°, "beaming" your antenna for best reception. Operates in any weather, as rotor is water-tight. Makes pictures clearer and sharper, signals stronger. Reduces noise. Easily attached to any type of antenna. "Arm-Chair" control with attractive plastic control box which plugs into house circuit. Equipped with Automatic Stop. **\$39.95**



4 cond. cable for above. per ft. **4c**

G.I. TV TUNER

All channel continuous tuning front end that will improve results on any TV kit or set. Uses 3-6J6's in newly-designed capacitance-tuned circuit. Dimensions: 7" H x 3 1/4" W x 6 1/4" D. Shaft extends 2 1/2". Extremely stable, high gain. Net Cost. **\$27.50**



GET TELEMATCH FOR BETTER TV

Made by Stancor, Telematch eliminates antenna impedance mismatch. Immediately minimizes ghosts, reduces interference. Startling results with indoor antenna. Your cost. **\$9.50**



SENSATIONAL NEW WAFER THIN Magnifier Lens

Wide-angle, FLAT lens. No bulk, no oil. Extremely light weight. Excellent, distortionless enlarger. Conventional adj. bracket. 9"x15" clear. **\$22.95**

9"x15" clear. **\$29.95**

9"x12" filtered. **\$25.95**

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LAST MINUTE SPECIALS

2 volt Willard storage battery. **\$1.25**

2 volt vibrator. **49c**

150 ma. pwr. xformer, 6 V tubes. **\$3.39**

115 ma. pwr. xformer, 6 V tubes. **\$2.95**

GREYLOCK RADIO TUBE BARGAINS!

GT, Glass and Miniature Types

1R5	3Q4	12SA7GT	} 39c each
1S5	3V4	12SK7GT	
1T4	6AT6	12SQ7GT	
1U4	6BA6	(and many others)	
354	6BE6		

SPECIAL OFFER! All above types may be purchased in lots of 100 assorted, at \$35 per 100.

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6AG5		1B3-8016	
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All tubes in individual cartons

TERMS: Net C.O.D., F.O.B. NYC. MINIMUM ORDER \$5.00.

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It is easy to learn or increase speed with an Instructograph Code Teacher. Affords the quickest and most practical method yet developed. For beginners or advanced students. Available tapes from beginner's alphabet to typical messages on all subjects. Speed range 5 to 40 WPM. Always ready—no QRM.



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BUILD YOUR OWN WITH RADIO KITS!

**Complete Kits Plus Detailed Instructions
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SWEEP GENERATOR



*** Assemble this kit now and be ready for FM and TV servicing! 5 tube circuit. Covers 2 Mc. to 226 Mc. 110 V AC. Supplies RF or FM. Variable sweep width 0 to 10 Mc.**

dial. Variable phasing control. Easy to build!
Ask for KIT MODEL SW5..... **\$22.95**

SIGNAL GENERATOR



This useful signal generator is a necessity for every servicing need. 150Kc. to 30 mc/cycles on fundamentals. Can be extended to cover over a 100 mc/cycle range on strong harmonics. 110V AC power supply. 400 cycle oscillation may be used internally for modulating the signal for audio testing for KIT MODEL 562.

\$18.95

VACUUM TUBE VOLTMETER



- 6SN7 bridge type voltmeter circuit.
- 0.500 microamps DC $4\frac{1}{2}$ square meter.

11 megohms DC, 6.5 megohms AC input resistance. .01 ohms to 1000 megohms in 5 ranges. Linear AC-DC volts 0-1000 volts, 5 scales. 6H6 balanced linear diode AC rectifier, 1% precision resistor. The perfect instrument for signal tracing and dynamic testing. Ask for KIT MOD-EL \$23.95

for KIT MOD.
\$23.95

HIGH FREQUENCY PROBE for FM and TV work, for use with voltmeter, only. **\$6.00**

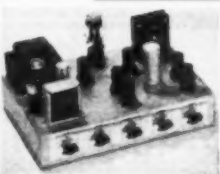
Three-Way PORTABLE RECEIVER



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AMPLIFIER
with Cathode
Follower
Output**

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RADIO KITS COMPANY

120 Cedar Street

New York 6, N. Y.

"Electric Eye"

(Continued from page 51)

remove the hum and patch up the distortion.

Well, Xavier is not in sight, so we go on to see more of his work. The electrical department is next, and there is a salesman holding a match and lifting it up to a dark electric lamp in a socket, just as though it were a candle that needed lighting. When the match reaches the lamp, it lights. Then the salesman takes down his hand and blows out the match, while the ladies near him point and seem much amused. After some talk, he reaches up again, waves his handkerchief at the lamp, and it goes out. This one is easy to figure out, because anyone can see the box right next to the lamp, with a hole in it; and of course the photorelay is right inside the box. When the match illuminated the phototube, it turned the lamp on.

After that, the lamp kept illuminating the phototube, so that it stayed on. This is also just like the sign control, except that the relay contacts are connected up in the opposite way—the open side of the relay instead of the closed side. When the salesman put his handkerchief there, between the lamp and the phototube, he covered the phototube opening momentarily, and that darkened the phototube, turning off the lamp. After that, there wasn't enough light to get the lamp on again, so it stayed off. This circuit is so easy that I haven't bothered to copy it down.

Next is the drug department, and there is a big sign which says "Individually prescribed *face powder* to fit *your face*." We watch the lady place her cheek to the small hole in the machine, and how the clerk turns in the first filter, takes a reading, then turns in the next filter, takes another reading, and so on. Then, the clerk compounds a special face powder with ingredients to neutralize the unwanted

Fig. 3. This photoelectric door signal circuit has a sensitivity that will surprise you. The transformer heats the cathodes of both tubes, lights the lamp, and may also be used to furnish 50 volts for a chime. You might notice that the 6V6 heater-to-cathode voltage is the full-line voltage which is more than is recommended for the tube. If that bothers you, then just use another transformer for the 6V6 but I know that it will not give you any trouble because the rating was probably set low to prevent hum pick-up in audio and radio circuits. Xavier reports he has never had any trouble with heater-to-cathode breakdowns here.

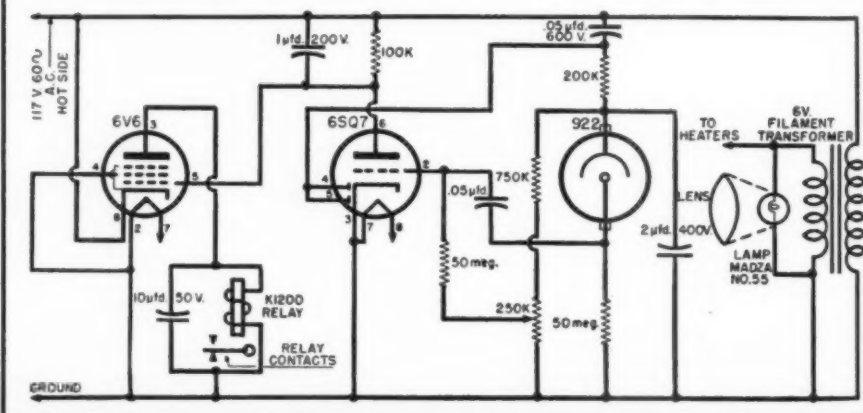
The 6SQ7 tube is used as two tubes, as a rectifier to furnish filtered d.c. for the phototube and grid circuit, and as a high gain voltage amplifier. The .05 μ d., 600 volt condenser pulls electrons from the 6SQ7 diode plates during half of each cycle, and these electrons leak back through the 750,000 ohm resistor and the 250,000 ohm sensitivity control, to make a well-filtered minus-to-ground d.c. supply, good for phototube and grid bias requirements. Of course, if you don't care about the saving of a tube, you can replace the 6SQ7 with a 6X5, and put a 1V rectifier in where the .05 μ d. condenser is in the circuit.

The high negative voltage, about 100 volts, is applied to the 922 phototube in series with a really large resistor, 50 megohms. The voltage divides more or less equally between them, according to how much light is on the phototube. A .05 μ d. condenser couples the mid-point between these two to the control grid of the triode voltage amplifier, and controls it. The second 50 megohm resistor is a grid leak and controls the grid bias of the 6SQ7. If the 6SQ7 is a gassy tube with grid current the circuit won't work, so be sure to use a good tube. Also, if the .05 μ d. coupling condenser is at all leaky, the grid will be drawn too negative. Use a new, well-waxed, low-leakage condenser and be sure not to let it get overheated from your soldering iron.

This grid circuit will let the control grid settle down to a constant bias as long as the phototube is illuminated constantly. However, if the phototube is darkened suddenly, the current through it stops, the grid gets a kick in the positive direction, and because of the high megohm resistors, this kick will last a few seconds. The plate current through the 6SQ7 rises to a high value and the 1 μ d. condenser in the plate circuit charges. This makes the control grid of the next tube, the 6V6, go more negative with respect to its own cathode, which is just right for shutting off plate current. The 6V6 had plate current because its plate is "plus" half the time. This tube operates half of each cycle, just as the 6SQ7 operates half of each cycle, but the two of them work on alternate half cycles, not together. Doing it this way saves a high voltage transformer, and has the effect of another plate supply.

Be sure to put the condenser across the relay coil in its proper polarity, with the plus side to ground, not in the usual way. A small paper tubular is entirely satisfactory and does the job of taking the buzz out of the relay. The relay contacts are normally held closed, and released when someone walks through the beam of light. If you want to reverse this, it can be done easily—just interchange the 922 phototube and its 50 megohm series resistor. Be careful not to reverse the polarity of the phototube or it won't respond at all.

This two-stage circuit is so sensitive that the 1 candlepower lamp with a 1" diameter lens in front of it can work the photocell over 20 feet away, and even if different amounts of daylight get into the photocell during the course of the day, the amplifier will not be biased improperly but will respond as it should.



shades. That is quite an idea, and the ladies seem to like it a lot, because they keep coming back for more of that expensive powder, especially the ladies that can't boast about their complexion.

This "Cosmetigraph" uses a very simple circuit, just a photocell of the self-generating kind connected to a microammeter, just as you have in your exposure meter that you use in taking pictures. The real work in it lies in the mechanical parts, getting the light to shine onto the skin without "specular" reflection effects, and collecting the light efficiently and accurately.

Now we come to the tobacco counter, really crowded and with everybody smoking away real hard. Over to the left there is a lot of coming and going, and people seem to be waiting a turn. We elbow over, and see what the attraction is—a big glass tube. That must be the smoke measuring outfit Xavier just completed, with a milliammeter to show how much smoke is in the tube. The big man presses a button, and a fan blows out the old smoke in the tube. He exhales gently into the tube, and the indicator goes way down. Now comes a thin chap with a pipe. He doesn't do as well, and there is much comment and discussion about lung size, black smoke, and light smoke. This setup is shown in Fig. 2.

Just then, Xavier himself comes along with a pencil and a pad. He is glad to see us, but we are late, and now there isn't much time. At this hour he must check over the figures on the inter-departmental counting machines which measure the volume of traffic today in the underwear department. It seems that the boss thinks this is a good way to compare the "Planet" advertising with that in the "Clarion."

So off he went, a happy, busy man. He is stouter and more prosperous looking now. Probably his clothes are made to order.

-30-

KEEP EQUIPMENT INTACT

AN ORDINARY lunch box serves as a suitable container for soldering irons of the late models, iron support, solder, tape, and other needed equipment.

The assembled outfit may be kept at the work bench where it is easily picked up for use away from the shop.



May, 1949

SAVE! ELECTRONIC EXPEDITERS SAVE!

TUBES!!! Receiving, Special Purpose, and Transmitting JAN and Commercial.

Bulk and Boxed				Bulk and Boxed			
1A5GT. \$0.70	5PB4. \$4.00	7C4. \$0.35	45. \$0.50	615. \$12.00	872A. \$2.50		
1AB5. \$0.50	5CP1. \$4.50	7F7. \$0.90	50B5. \$0.75	715B. \$7.95	878. \$6.00		
1B26. \$3.00	5FP7. \$3.75	7H7. \$0.75	70L7. \$1.50	703A. \$4.50	908. \$5.50		
1LC6. \$0.95	5Z3. \$0.70	7N7. \$0.90	77. \$0.60	707B. \$19.00	954. \$5.00		
1LD5. \$0.95	6AK5. \$1.50	9GP7. \$12.50	78. \$0.60	713A. \$2.00	956. \$5.00		
1N5. \$0.95	6H8. \$0.80	10Y. \$0.65	80. \$1.50	714AY. \$15.00	957. \$5.00		
1N5GT. \$0.80	6C4. \$0.35	12A6GT. \$3.90	105P. \$0.80	717A. \$7.75	1616. \$7.00		
1R4. \$0.70	6C5. \$0.40	12C8. \$0.60	117L7GT. \$1.50	729CY. \$12.00	1619. \$5.00		
2C34. \$1.00	6E5. \$0.60	12GP7. \$12.50	123A. \$3.00	729A. \$18.50	1625. \$5.00		
2J21. \$2.00	6F5. \$0.65	12H6. \$0.40	205B. \$3.50	800. \$2.95	1629. \$5.00		
2J22. \$2.00	6J5GT. \$0.55	12HP7. \$14.50	211. \$0.95	801. \$1.50	1630. \$5.00		
2J40. \$2.00	6H6. \$0.55	12K7GT. \$7.75	224. \$0.75	803. \$9.95	1641. \$5.00		
2J61. \$2.00	6K7. \$0.65	12K8. \$0.90	250TL. \$18.95	815. \$2.95	1642. \$4.95		
2J62. \$2.00	68A2. \$0.65	12L5GT. \$3.35	304TH. \$6.50	826. \$9.95	2051. \$9.00		
2J49. \$2.00	68C7. \$0.70	12SGT. \$0.70	305A. \$10.00	837. \$2.50	7193. \$3.00		
3B7. \$0.35	68F7. \$0.85	12SH7. \$0.50	316A. \$2.95	841. \$7.90	8012. \$4.95		
3B24. \$2.00	68H7. \$0.75	12SN7. \$0.80	353A. \$4.00	843. \$7.90	9002. \$5.00		
3C31. \$1.75	68J7GT. \$0.40	12SR7. \$0.85	371B. \$2.50	851. \$9.50	9003. \$5.00		
3HP7. \$2.00	68J7. \$0.80	14A7. \$0.85	388A. \$5.50	864. \$6.90	9006. \$5.00		
3Q4. \$0.80	68L7GT. \$0.95	14Q7. \$0.85	450TH. \$24.00	865. \$2.00	91434. \$7.00		
3Q5GT. \$0.95	68L7GT. \$0.95	231D. \$0.85	527. \$18.00	866. \$1.25	VR130. \$8.00		
5AP1. \$4.00	68U7GT. \$0.80	231D. \$0.85	530. \$25.00	868B. \$25.00	VT77. \$4.50		
5BP1. \$2.95	7A7. \$0.70	39-44. \$0.40	531. \$20.00		VT127A. \$6.00		

AUDIO AND FILTER CHOKES

Stock No.	Induct. H.	MA	DC Ohms	Test Volts	Case Dimensions	Description	Fig.	Price
143	3/12	150/90	80, 215	2000	5 1/2 x 2 1/2 x 3 1/2	Dual Filter	D	\$1.90
146	5.3	60	475	2400	2 1/2 x 1 1/2 x 1 1/2	Filter	I	0.75
147	6	70	1000	1000	2 1/2 x 1 1/2 x 1 1/2	Filter	A	0.90
148	6	150	100	1500	3 1/2 x 3 1/2 x 2 1/2	Filter	A	1.95
149	7	60	350	2500	2 1/2 x 2 1/2 x 1 1/2	Filter	I	0.90
150	8	100	200	2500	2 1/2 x 2 1/2 x 2 1/2	Filter	A	1.40
151	12	100	540	2500	3 1/2 x 2 1/2 x 2 1/2	Filter	A	0.90
155	12	120	450	1500		Filter Mtg. Centers 3 1/2"	B	1.50
156	80	2.5	3900	500	1 1/2 x 2 x 1 1/2	Audio Choke	C	1.15

OIL-FILLED CAPACITATORS



Stk. No.	Cap. Mfd.	Work Volts	Manufacturer	Type No.	Fig.	Price Each
100	1.	600 DC	C-D	TJU6010	E	\$0.39
101	4.	600 DC	C-D	TDF6040	E	0.90
102	4.	600 DC	Micamoid		G	1.15
103	4.	600 DC	C-D	TLA6040	G	1.40
104	5.	220 AC	FAST		A	0.59
105	8.	600 DC	C-D	48858-10	C	1.35
106	1-8.	600 DC	C-D	48859-15	C	1.45
107	2.	1000 DC	Gudeman	7612	B	0.85
108	2.	1000 DC	Utilities		B	0.85
109	2.	1000 DC	C-D	TLA10020	D	1.15
110	4.	1000 DC	C-D	TQ10040	D	1.35
111	4.	1000 DC	Aerovox	1005	D	1.35
112	6.	1000 DC	TOBE	TR810012	E	2.25
113	6.	1500 DC	TOBE	TR81506	E	2.25
114	1.	2000 DC	C-D	TJU20001	E	0.75
115	1.	2000 DC	GE	25F615	B	1.35
116	1.	2000 DC	Solar	XL1MJW20-1	E	1.35
117	1.	2000 DC	C-D	TJ20010G	E	1.35
118	1.	2000 DC	C-D	TJ20010G	E	1.50
119	1.	2000 DC	Gudeman	7631	B	1.35
120	2.	2000 DC	Gudeman	7631	B	2.85
121	2.	2000 DC	Solar	7630	B	3.85
122	2.	2000 DC	C-D		B	3.10
123	2.	2500 DC	Aerovox	2509	E	3.60
124	4.	3000 DC	GE	23F44	F	6.95

POWER TRANSFORMERS 115V 60 CY. PRIMARIES Double Half Shell Horizontal Mounting

Stock No.	H.V. MA.	H.V. CT.	Rect. Volt.	Fil. Amps.	Filament Volts	Filament Amps.	Price Each
130	70	600V	5V	2A	6.3V 1.85A		\$2.25
131	100	670V	5V	3A	6.3V 2.8 A		3.00
132	100	700V	5V	2A	6.3V 2.5 A		3.00
133	125	700V	5V	2A	6.3V 4.1 A		3.15
134	190	780V	5V	3A	6.3V 5.0 A		4.50

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This is the Navy VHF unit. Conversion dope supplied makes it the hottest 2-meter transceiver. 144-148 Mcs. With tubes, dynamotor and crystals. Used but in excellent condition. Ea. **\$17.49**

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Brand new. Ea. **\$3.50**

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No. 3—3995 to 4450 Kc
No. 8—3525 to 3980 Kc
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Ea. **79c**

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COLUMBIA ELECTRONICS

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LOS ANGELES 13, CALIFORNIA

Projection Television

(Continued from page 49)

tube neck) or away from the tube (at right angles to the tube neck). The visual effects of improper positioning of the magnets are shown in Fig. 6.

In the RCA and G.E. projection receivers the additional bar magnets are not required because the translucent screen is not slanted and because it is perpendicular to the axis of the optical system. Hence, a rectangular image on the projection tube face appears as a rectangle on the screen. The translucent screen used in these sets is composed of two lucite sheets with a partial diffusing layer between them. The back sheet has a fresnel lens molded into its rear surface. The front sheet has vertical ribs molded into its outer surface. The fresnel lens functions to concentrate the light into a narrow viewing angle. The vertical ribs act to increase the horizontal viewing angle above that obtained with a flat surface. The diffusing layer eliminates interference patterns between the fresnel lens and the vertical ribs. The screen and lens combination give a gain of approximately five over that which would be obtained from a ground glass screen.

In the RCA and Philco receivers, the projection tube, the spherical mirror, and the correcting lens are all mounted in what is known as an "optical barrel." See Fig. 9. The spherical mirror is mounted in the bottom of the optical barrel and held against a knife edge by three sets of springs. The spring pressure is strong enough to hold the mirror securely against the knife edges, but not sufficient to distort the spherical mirror.

The 5TP4 is held in a retaining ring within the optical barrel, the face of which is approximately one-half way between the correction lens and the mirror. The tube is adjusted to posi-

tion by controls on the side of the optical barrel. Optical focusing is accomplished by moving the picture tube up and down vertically. Other adjustments are needed to secure proper centering of the picture tube on the optical axis of the mirror. The correction lens is held in the ring on top of the barrel and secured by three spring fingers.

Another variation of the Schmidt optical system as adopted for television is that devised by North American Philips. The system, known by the tradename of "Protelgram," is an adaptation of the "folded" Schmidt system and occupies only half the space of a conventional arrangement. Since the light path is folded, it is possible to mount the projection tube with its optical system within a small metal box, thereby producing a compact and dustproof arrangement. The actual metal case measures only 8½" x 8½" x 9". It contains three optical elements: (1) a 6" spherical mirror, (2) an aspherical corrector lens, and (3) a special plane mirror to "fold" the light beam. See Fig. 8. These three elements form an optical triangle within the optical unit and are adjusted at the factory. They remain in adjustment under normal use. The optical unit is dustproof, with only the upper face of the corrector lens being exposed. It can be dusted with an ordinary cloth without scratching. The light emitted from the tube face is gathered by the spherical mirror, reflected to the plane mirror and then projected upwards through the corrector lens. At the center of the plane mirror there is a hole large enough to permit the projection tube face to be inserted through it. Behind the mirror ample room is provided for the deflection and focusing coils of the tube, plus whatever tube supports are required. There is no interference from the coils and the neck of the tube, since these are behind the plane mirror.

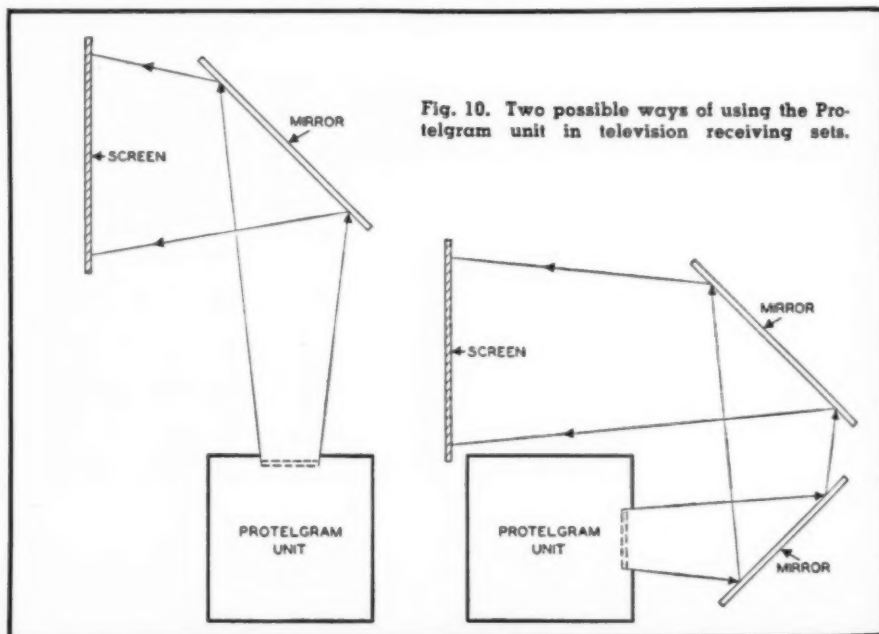


Fig. 10. Two possible ways of using the Protelgram unit in television receiving sets.

A throw distance of 31" from the corrector lens to the viewing screen is required to produce an image 12" x 16". Extending behind the tube face and for 7½" beyond the 9" dimension of the optical unit is the alignment assembly. This carries the tube and socket, focus, horizontal and vertical deflection coils and aligns the tube optically by means of three screws, which can be locked to insure good mechanical stability. Horizontal and vertical deflection coils are inside the optical unit; the focusing coil is outside. The tube is firmly seated in the plastic coil forms for the deflection coils, which are designed so that linear current will produce linear deflection over the full picture area.

A special small-size cathode-ray projection tube (3NP4) was designed for this unit. The tube screen diameter is 2.5 inches from which is obtained a 1.4 x 1.86 inch picture. 2.5 inches appears to be the smallest practical size from which an enlarged image can be obtained. The tube uses magnetic deflection, magnetic focusing and 25,000 volts for acceleration. The spot diameter at the tube face is 0.003 inches and this permits 450 line resolution to be obtained. The high-voltage anode terminal consists of a button in a glass cup sealed to the cone of the tube. The glass cup lengthens the external leakage path from the high-voltage contact to the coils thereby minimizing any tendency for arc-over to occur. The outside of the cone and part of the neck are covered with a conductive coating that can be grounded. This outer coating, together with the conductive coating inside the tube, forms a 300 µfd. condenser which can be utilized for filtering of the high voltage. The neck of tube is quite narrow and, in conjunction with a deflection angle of only 40 degrees, permits full deflection to be achieved using only as much deflection current as ordinarily supplied to a 10BP4 direct-viewing tube operating at 9 kv.

A 25 kv. second anode is needed for the 3NP4 with better than average stability. Since existing types of high-voltage power supplies were found to be unsatisfactory, a new, compact unit was designed having low weight, small size, great stability and no r.f. radiation. See Fig. 7.

The flexibility of this particular design is illustrated by two possible arrangements, Fig. 10. In the left-hand illustration, the beam emerging from the corrector lens is folded once more by a second mirror tilted 45-degrees. For an even more compact arrangement, the beam can be folded twice after leaving the "Protelgram" unit.

For future projection television receivers, the immediate objectives are: greater light intensity on the viewing screen, better contrast, and increase in horizontal and vertical viewing angles.

Projection television, while presenting more problems must, nonetheless, keep pace with direct view receivers.

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VERTICALLY-HORIZONTALLY

BUILT IN
FILTER ADAPTER
WITH REMOVABLE
GLARE CONTROL
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STYLED TO ENHANCE
TELEVISION SET
APPEARANCE

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Wheatstone Bridges (0 to 11, 110 ohms)...	\$5.50
Western Air Port Photo-light Control Units...	\$9.90
Western Model 680-1F Industrial Ohmmeter and case or wall C.B. Telephones and	12.90
W. E. Desk or wall C.B. Telephones and	
ringer (complete)...	4.99
RCA 5", 3" and 2" Cathode Ray Tubes...	3.55
RCA Light, burglar alarm kit. Consists of rectifier, photo cell, thyatron, relay, sockets, etc.	4.49
Drill press 31" polishing-grinding shaft and stone	1.29

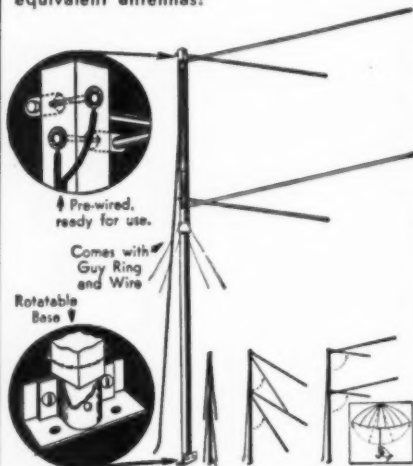
Other items include gas engines, chromofux elements, radar altimeters, tubes, transformers, etc. Order from ad or send card for bargain catalog. Satisfaction guaranteed. Our reference—National Bank of Commerce.

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() Send me details of your DEALER PLAN

Name please print

Street

City and Zone State

Spot Radio News (Continued from page 16)

gle stage. The RCA specialists emphasized that their system should not be cited as a means of obtaining higher power from many small tubes, but rather as a means of increasing transmitter output when existing tubes have been improved so that they could handle more power.

Another approach to the high-power problem was demonstrated at a special engineering-press meeting by Westinghouse at their Lansdowne, Maryland, plant. In this method, described as a *Symmetron* power amplifier, tubes are operated in parallel and symmetrically inserted into coaxial tanks (cathode and plate). Each tube, therefore, sees the same electrical and mechanical configuration for all operating frequencies. Thus the design lends itself to multiple tube operation. Two to ten tubes or more may be operated in parallel without affecting the circuit symmetry. This type of circuit is associated with simplified wide-range tuning, a 50-kilowatt tank requiring only three adjustable tuning controls, cathode tuning (shorting bar), plate tuning (shorting bar), and output coupling (condenser). These controls are motor driven and tune through the complete FM band of 88 to 108 megacycles without mechanical adjustment of the tank, which is in contrast to the conventional FM grounded-grid, push-pull amplifiers, using two-wire transmission line tanks, where even at lower power levels, up to nine adjustable controls are required.

Using the present types of tubes, the *Symmetron* system was said to provide powers of 75 kw. in the standard FM band; 25 kw. in the 54 to 88 mc. TV band; 10 kw. in the 174 to 216 mc. TV band, and for black and white or color TV, one to two kilowatts in the 500-1000 mc. spectrum. Westinghouse engineers declared that these power levels were from one to one-and-one-half times greater than those available with current equipment designed to operate on the ultra-highs.

Ultra-high telecast studies are continuing at a merry pace, too, with NBC and the Washington consulting engineering firm of McNary and Wrathall preparing four setups for tests. NBC has asked the FCC for permission to install a 846-854 mc. transmitter, using a rated visual power of 100 watts and a peak carrier power of 400 watts, at their Princeton labs and another ultra-high unit, operating on 529 mc., installed in the vicinity of Bridgeport, Conn., which is expected to have an effective radiated power of between 15 and 20 kilowatts. The other two experimental stations are being planned for Scranton, Pa., and Pawtucket, R. I., with a frequency of 515 mc. used for a pulse-modulated visual signal having a power of 5 kilowatts. Slotted cylindrical transmission antennas with power gains of ten

SURPLUS BARGAINS

FM REC. BC 603

For 10 and 11 meters. 20 to 30 MC superhet, BFO, squelch; 10 push-buttons and manual tuning. Makes fine wide-band IF strip for 88-108 MC FM with converter. Includes 10 tubes, speaker, case, and diagram. 12 volt. Used, good. \$12.95

R4-ARR-2 Receiver. See RADIO NEWS, P. 112, Jan. 1949 issue. Used, good. \$10.95

Radio Transmitter & Receiver APS 13. 410-420 mc., light weight, fully enclosed; 30 mc. I.F. complete with 17 tubes, including 5-6J6; 9/6AG5; 2/2D21; 1/XR105. Brand new with manual. \$17.95

APS 13 Racks, New. \$1.00

Handy Talkie Batteries. Good condition. BA-37 \$1.00 BA-38 \$1.00

COMMAND REC.

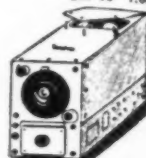
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BC453—1.9-550 KC \$12.95

BC454—3-6 MC 5.95

BC455—6.9-1 MC 6.95

6 1/4' CONTROL CABLE for above command sets. \$1.00



APN 1. Used, good. \$7.95

BC 684 Transmitter. Used, good. \$12.95

Climbing Equipment

Safety belt, leather. Good used. \$2.95 ea.
Pole Climbers, and straps. Good, used \$1.95 pr.

R-5/ARN-7 COMPASS RECEIVER

Includes broadcast band. Freq. 160-1750 kc. in 4 bands. 5-gang tuning capacitor, 15 tubes: 4-6K7, 1-6L2, 1-6J5, 2-6BR, 2-6F6, 1-6N7, 1-6SC7, 2-2051, 1-5Z4. Like new. \$17.50 ea.

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FACTORY SEALED CARTONS, ANY ASSORTMENT—25 for \$9.95; 50 for \$18.00; 100 for \$35.00.

1R5	354	12SA7GT	35W4
1S5	3V4	12SJ7GT	35Z9GT
1T4	12AT6	12SK7GT	50B5
1U4	12BA6	12SQ7GT	50L6GT
3Q4	12BE6	35B5	117Z3

ASSORTED BULK-PACK LOTS—25 for \$8.75—50 for \$17.00—100 for \$33.00.

The following tubes at 49c each

6AG5	6AU6	6T8
6AK5	6F8G	12AU7
6AL5	6SN7GT	19T8

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are expected to be used. WQAN will conduct the Scranton tests and WCFI, the Providence studies. It is believed that about \$10,000 will be spent for each experiment.

TRENDS IN MINIATURIZATION in industry and the military were accentuated at the IRE national convention exhibits at the Grand Central Palace, New York City. The U. S. Navy displayed a complete receiver, formerly requiring 12,160 cubic inches, compressed into a volume of 3,150 cubic inches, with no efficiency lost in the transfer. A ten-tube receiver, weighing but one pound and sealed in a plastic case, three inches by six inches by one inch thick, was also on view. An answer to every serviceman's prayer, a test kit with all of the basic tools in a container less than a foot long, was also shown by the Navy. Containing fountain-pen like instruments serving as voltmeters, ohmmeters, soldering irons, vacuum-tube testers, signal generators and tracers, plus other test essentials, the kit weighs about twenty-five pounds and is ten by ten by nine inches in size.

Describing this *dream kit*, E. J. Nucci of the Navy Bureau of Ships, said that the kits are being expanded a few inches and increased in weight about two pounds to include a 'scope, to provide maintenance and service for practically every type of first-aid problem.

THE AVERAGE LISTENER prefers the full frequency range in speech and music, and not a restricted frequency range, Harry F. Olson of RCA Labs, said at the IRE meeting during a talk on the reproduction of sound.

Analyzing this and other related factors, Olson disclosed that there are six physical aspects of a musical tone: intensity, fundamental frequency, overtone structure, duration, growth and decay, and vibrato. He said that an examination of these physical aspects shows that speech and music are exceedingly complex, and since sound-reproducing systems involve all manner of mechanical vibrating elements, one would expect deviations from true fidelity of reproduction. However, Olson continued, it is truly remarkable and fortunate that tremendous deviations from true reproduction may be made and we may still retain a system which is acceptable by the average listener.

Olson pointed out that there are seven types of defects which must be considered in order to reproduce the physical characteristics of a musical tone, and which should not be present in a distortion-free system: amplitude distortion, nonlinear distortion, phase distortion, transient distortion, noise, directional pattern of reproducers, and seven conditions of deviations (single channel system, special distribution, acoustics of two rooms—the pickup studio and listening room, limited dynamic range, microphone placement and balance, difference in

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ALL FOLLOWING TRANSFORMERS
115 V.A.C. 60 CYCLE INPUT

OUTPUT: 750-0-750 V.A.C. (600 V.D.C. after choke input filter at 250 MA.) Includes 6.3 V.A.C. winding at 5 amps and 5.0 V.A.C. winding at 4 amps. NH-106 \$7.95
OUTPUT: 600-0-600 V.A.C. at 250 MA. 12 V.A.C. at 3 amps; 12 V.A.C. at 3 amps and 5 V.A.C. at 3 amps. Designed for Army surplus transmitters. NH-108 \$6.90
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CHOKES:

NH-115—8 Henries at 500 MA. filter choke, 5,000 volt insulation \$8.67
NH-116—5-20 Henries 500 MA. swinging choke, 5,000 volt insulation \$8.37
NH-117—8 Henries at 700 MA. filter choke, 7,500 volt insulation \$12.90
NH-118—5-20 Henries at 700 MA. swinging choke, 7,500 volt insulation \$12.45
ALL ABOVE ITEMS BRAND NEW—NOT SURPLUS!

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HIGH VOLTAGE TRANSFORMERS AND CHOKES

INVERTER MG-149F

Input 24 Volt DC; Output 26 Volt DC, 250 VA 400 cycle, or 115 V. 400 cycle 500 VA. Appear to be unused; are re-finished and tested. Price \$14.95

AC POWER SUPPLY
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Completely wired power supply and speaker with volume control C.W. and on & off switch, housed in metal cabinet. For command receivers with connections to plug into receiver and 110 Volt 60 cycle line. Voltage output: 250 V. 60 MA., 6.3 V. and 24 V. Price: Completely wired \$14.95
Kit of Parts 9.95

SELSYN 21G1—Can be used as position indicator for antennas; 110 Volt 60 cycle, with instructions. Normally operates from 57.5 Volts 400 cycle. Price per Pair \$3.00

SELSYN 2 C-78248—115 Volt AC 60 cycle. Size 7 3/4" x 5 1/4". Can be used to turn small antennas or for position indicator systems. Price per Pair \$5.95

SELSYN TRANSMITTER AND INDICATOR
SYSTEM

Ideal as radio beam position indicator for Ham, Television, or Commercial use. Complete with five inch 1-82 Indicator, Autosyn Trans., 12 Volt 60 cycle Transformer, and wiring instructions. Price—New \$9.95

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BC-1206 C Rec. 200-400 KC. DET. 6 tube set. \$6.95
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Plug for I-82 Indicator PL-118 1.00
Plug for I-82 Loop, PL-112 or PL-108 1.00
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BB-54 2 Volt Dry Cell Battery 1.50
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Base Insulator: Four section, steel, extends 6'2" to 23'6". Diameter taper from 1 1/4" to 3/4". Each section fitted with adjustable locking clamp. Can be adjusted to length required for freq. Brown glass base insulator and stand off. (Illustrated at left.) Price... \$12.95

WHIP ANTENNA FOR MOBILE
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MP-48 Mast Base Mounting with heavy vertical Coil Spring, insulated at top to receive Mast Section MS-53. Mast Base only \$2.95



MAST SECTIONS

For above MP-48, tubular steel, copper coated, painted—in 3 foot sections. Bottom section MS-53 can be used to make any length. MS-52-51-50-49 for taper. Screw-in type. Any Section. Price 50c Ea.

WHIP STEEL—24 ft. two piece. Bottom section 4 ft. long. Taper 3/4" to 1/2". Bottom Section threaded 3/4". Price \$2.50

TELESCOPING STEEL ANTENNA—3 Sections, 94" long. Telescoped 46". Size: 3/4" to 1/2". Price \$1.75

ANTENNA ROTATOR—Ideal reversible motor for rotating all types of antennas at the top. Weighs only 4 1/2 lbs. Size: 7 1/2" L. less shaft. Gear box and Mtg.: 4" x 3 1/2". Motor size: 5" L. x 2 1/2" D. Shaft size: 3/8" x 1 1/2" threaded. Operates from 24 V. DC, 2 amps. 4.5 RPM or 36 V.A.C. Torque: 70 lbs. per inch. Price \$8.95

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TRANSFORMERS—110 Volt 60 Cycle Primaries:
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Sec. 24 V. 1 amp. 1.95
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Sec. 14-14 or 28 Volt—7 1/2" or 15 amp. 4.95

HIGH TORQUE MOTOR for Antenna Rotation—3 RPM; operates on 110 Volt 60 cycle with 10 MFD condenser; normally 110 Volt 400 cycle, reversible. Instructions included. Size: 4" x 4". Price: \$2.95. 10 MFD Cond. only \$1.00. Reversing Switch @ 35c

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6 or 12 Volt AC-DC Heavy Duty reversible motor with 3/8" x 1 1/2" shaft. Price: NEW \$2.95
6 Volt AC-DC Motor—Ideal for auto fans, models, etc. Shaft 3/8" x 3/4". Used—Tested \$1.50

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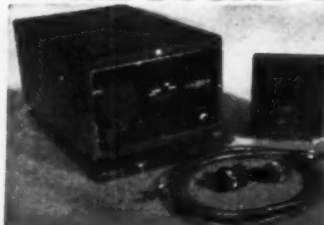
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"This is the hottest little receiver on the market at any price. Does everything the BC-348 will do, and then some."

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It's the FAMOUS BENDIX RA-10 RECEIVER. An 8-tube superhet. Tunes 150 to 1100 kc. and 2 to 10 mc. Tunes from remote control. Comes complete with tubes, built-in dynamotor, plugs, control box, and flexible tuning shaft. Ready to operate. BRAND NEW, as received from factory. Available for 12-volt or 24-volt operation. A \$500 set for... \$69.95
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BC-645, original and conversion, fixed or mobile. Includes PE-101-C..... \$1.00
BC-375-E step-by-step conversion to AC, with power pack..... \$1.00
BC-375-E original schematic plus tuning units plus complete parts list with values and characteristics plus plate current information..... \$2.00
SCR-274-N receivers, BC-453, 4, 5: Conversion of front plug to local control adapter. AC power. Alignment. Parts location. Voltage and resistance readings. Interconnections. Large clear sheet..... \$2.00
MN-25 operation and maintenance manual, 145 pages..... \$5.00
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SCR-274-N Transmitter schematics, including modulator, rack, and control box..... \$1.00
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SCHEMATICS: \$100

Each
ARN-7 BC-433-G BC-733-D ART-13A
APN-1 APN-9 SCR-625 APT-2 BC-1206-C
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No. 19 MARK II Sender-receiver

Please remit With Order. We Pay Postage. Send 25c and stamped addressed envelope for comprehensive list, cross-indexed for BC and SCR. Includes chart explaining code used in Army-Navy nomenclature.

R. E. GOODHEART 345 1/2 N. PALM DRIVE
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Premax Adjustable V Dipole Antennas permit the proper vertical or horizontal adjustment of the elements to prevent, as generally happens with horizontal type dipoles, the combining of a "direct" with a "reflected" signal which results in a cancellation of both signals and poor reception.

The Premax V can be adjusted to the proper vertical or horizontal position to make the two signals combine in phase, thereby increasing rather than reducing the received signal.

Another Premax feature is that, properly mounted, it permits a sufficient signal energy at the antenna terminals to minimize the importance of the otherwise difficult task of perfect impedance matching.

Service men, installing the Premax V, find it insures optimum reception of signals from ALL of the TV stations within the line of sight.

Premax V is a low-cost antenna, easy to install and profitable to the service man. Send for details.

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level of the original and reproduced sound, and volume effects of rooms).

INTERFERENCE from auto ignition and electrical equipment, a serious problem in reception and particularly television, is receiving legal attention in Great Britain with a Wireless Telegraphy Bill, which would make it mandatory to equip all units which may radiate electromagnetic energy with suppressors.

Discussing this move during an interview in New York City, Dr. R. L. Smith-Rose, director of research of the department of scientific and industrial research, London, and formerly vice president of the IRE, said that the bill would undoubtedly pass and guarantee interference-free reception. According to Dr. Smith-Rose, all manufacturers of accessories or automobiles which might radiate will have to secure an approved certificate, indicating that tests have been made to assure radiation-free performance.

In a query covering the 405-625-819 line debate now raging across the continent, Dr. Smith-Rose said that the British industry has not changed its opinion as to the virtues of the 405-line method, since it was believed that this standard was the most efficient in relation to cost and ether space occupied. The 625-line system, which seems to be favored by those in Sweden and Germany as well as Belgium and Switzerland, and the 819-line system popular in France, is not practical for Great Britain, according to Dr. Smith-Rose. The 625-line system, which has been developed by Philips of Eindhoven, and uses a 6-mc. bandwidth with two-to-one interlacing, does have many interesting possibilities according to other continental experts who were interviewed during their recent attendance at a series of lectures on television in this country.

FORMER PRESIDENT HERBERT HOOVER was honored at a recent luncheon of the Radio Executives Club at the Hotel Roosevelt, New York City, for his pioneering work in radio legislation and control while Secretary of Commerce and as President.

As tokens of esteem, the club presented Mr. Hoover with the original microphone that he used on January 15, 1921, at the European Relief dinner in the Duquesne Club, Pittsburgh, when he spoke over KDKA, and the microphone used at the White House while he was president.

A galaxy of outstanding technical, administrative, and entertainment personalities joined in the tribute, including Laurence Tibbett of the Metropolitan Opera; David Sarnoff, RCA Chairman of the Board; Walter Evans, president of Westinghouse Electric broadcasting division; Frank Stanton, CBS prexy; Wayne Coy, FCC Chairman; Norman Luker, North American Director of BBC; Ted Streibert, WOR prexy; Allan Hoover, son of Mr. Hoover; A. D. Willard, executive vice president of NAB; Ted Husing, fa-

mous sports announcer; Carl Haverlin, president of the club; and Frank M. Russell, vice president of NBC in Washington, D. C.

THE EXTENSIVE PREPARATIONS

required for that epic inaugural TV network program a few months ago were disclosed recently in a special report.

According to this review, more than 550 long-line telephone experts were trained for the event, who for two months prior to the telecast were engaged in lining up and testing the coaxial links. The tests, which involved many changes and adjustments, went on continuously right up until the program was scheduled to go on the air.

The Illinois Bell Telephone number two toll building in Chicago was the key center for much of the activity. For into the 157-foot basement vault of the building was placed the Chicago-Cleveland-New York and Chicago-St.-Louis coaxial cables. Although this building and its equipment were designed to handle telephone conversations, the center was established to provide a headquarters to monitor and switch television programs.

The report showed that 540 amplifiers had to be installed along the routes and an additional system of 250 amplifiers were required for the television terminals in the telephone buildings in each city of the network.

Today, the network, still in the improvement stages, but providing excellent services, links fourteen cities and 30 stations and serves one-fourth of the nation's population, a remarkable record of engineering progress.

L. W.

Queen-Donna (CQ) Grace Burbage, Humboldt College co-ed, was chosen to reign over the all-male student body of California State Polytechnic College at the annual Poly Royal celebration April 29 and 30. Miss Burbage shown seated at the controls of the college short-wave station, sent invitations to all hams to inspect the college's radio and electronics facilities during the two-day celebration on the San Luis Obispo campus. This is a regular, extra-curricular activity of the student body, planned, managed, and directed by the student leaders and is recognized nationally as a pioneer and model of vocational education of the college level.

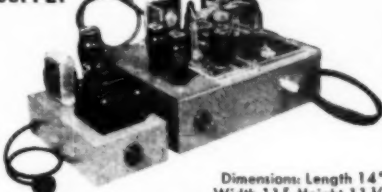


May, 1949

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30 KV RF POWER SUPPLY



Dimensions: Length 14", Width 11", Height 11 1/4"
New Improved unit of exceptional regulation. Has a focus control pot built in for use with STP4 Tube. Voltage variable from 27 to 30 KV. Supply utilizes 6 tubes.

Net price, including DC Power Supply.....\$99.50

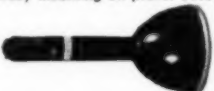


SPELLMAN F1.9 PROJECTION TV LENS

Dimensions: Length 7", Diameter 4 1/4"
F1.9 EF.5 in. (127.0 mm.) This lens incorporates in barrel a corrective lens for use with a STP4 projection tube. It is easily removable for use with flat type tubes. Lens can be utilized to project picture sizes from several inches to 7 x 9 feet.

Complete with mounting ring. Machine slotted Mounting Ring available for hand focusing adjustment. Has 4 holes for easy mounting on plate. \$8.00 extra.

Only \$90



STP4 PROJECTION KINESCOPE TUBE

Features a metal backed white fluorescent screen having high brightness and contrast.

Net Price.....\$67.50



HIGH VOLTAGE METER 0 TO 30 KV

A precision-made instrument with range from 0 to 30 KV. Has 4" scale and only draws 20 microamps. Bakelite meter panel housed in solid oak cabinet. Meter has jack connector for convenient connection to oscilloscope in checking voltage wave forms. Net price.....\$67.50

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10 KV.....	7.75
15 KV.....	7.75
25 KV.....	35.00
30 KV.....	35.00

FILAMENT TRANSFORMER FOR 1B3 Rectifier Tube.....90c

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Type	Capacity	Operating Voltage	Net Price
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10-20	500 "	20,000	.84 ea.
10-30	300 "	30,000	2.10 ea.
SKC 20-10	1600 mmfd	10,000	2.52 ea.
20-20	1200 "	20,000	3.36 ea.
20-30	600 "	30,000	4.17 ea.
SKC 30-10	3200 mmfd	10,000	4.17 ea.
30-20	2500 "	20,000	5.01 ea.
30-30	1200 "	30,000	5.85 ea.

NEW REAR PROJECTION PLASTIC TELEVISION SCREENS

The screen surface consists of a conglomerate arrangement of microscopic plastic crystals that "Pin Point" the projected image providing unexcelled angular viewing with a minimum loss of projected light. It is estimated that there is a loss of approximately 10% of light viewing the image at 45 degrees off center.

Light transmission percentages are controlled to obtain the maximum efficiency of the television optical projection system.

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BC 457 or ARC5, 4 to 5, 80 mc.
(slightly used) with
schematic.

\$8.95



Both for

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T20 ARC 5, 4 to 5.3 mc.	11.95
T22 ARC 5, 7 to 9.1 mc.	11.95
BC459 7-9.1 mc. (used).....	9.95
T22/ARC-5 7-9.1 mc. (new).....	12.95
(Used).....	9.95
T20/ARC-5 4-5.3 (used).....	4.95
274-N Type Trans. 2.1-3 mc. (used).....	5.95
BC 453 100-550 kc. (used).....	5.95
BC 454 3-6 mc. (new).....	5.95
(Used).....	3.95
BC 455 6-9.1 mc. (new).....	5.95
274-N Type Receiver 1.5-3 mc. (new).....	15.95
(Used).....	9.95
12 volt Dynamotor (can be used for above).....	7.95
ARB Recvr. 190-9.05 mc. continuous (exc. for marine) (used).....	19.95
ARN-7/BC 433 Recvr. 150-1750 mc. contin- uous (used).....	14.95
ASB/7 Indicator Unit with Tubes (exc. basic unit for 5" scope) (used).....	14.95

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Ideal as Radio beam position
Indicator for Ham, Television
or commercial use. **\$4.95**
Complete with I-82...

Spare set of Tubes for Command Recvr or
Trans. Specify which set..... \$ 1.29
Dynamotor 6 volts DC-300 volts DC 85 ma. 4.95
PE-103 Dynamotor 6-12 volts DC-500 volts
DC 160 ma. (new, complete with base)..... 14.95
(New, without base)..... 7.95

SCR-522 TRANS. & REC.

Like New..... \$39.80
BC 375 Tuning Unit New..... 2.45

FILAMENT TRANSFORMERS-110 volt 60 cycle

primary..... \$ 2.95

12-24 volt at 2 amp. 3.95

5-24-30 volt at 20 amp. 3.95

6.3 volt at 6 amp.-5 volt at 3 amp.-
33 volt at 150 ma. 1.95

PLATE TRANSFORMERS-115 volt 60 cycle

primary..... \$ 2.95

3200 volts NO CENTER TAP-NEW

Two (2) used SINGLE PHASE FULL WAVE

RECTIFIER CIRCUIT give 2000 volts

WITH 300 ma. LOAD..... \$ 8.95

2 for..... 15.95

540 C.T. @ 150 ma.

5 volts @ 3 amp.

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120 volts @ 10 amperes..... .89

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120 volts @ 30 amperes..... 2.49

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523..... .79 717A..... .89 V4150..... .79

757L..... 3.95 801..... 12.95 3047L..... .90

832A..... 3.95 955..... .59 6AJ5..... .89

6L6B..... .89 6AC..... .89 4527..... 12.95

801A..... .49 807..... .89 829..... 3.95

864A..... 1.39 810..... 4.95 65C7..... .89

954..... .89 8A5..... .89 803..... 4.95

6SN7..... .89 VT127A..... 2.95 1616..... .89

6J7..... .79 860..... 4.95 872..... 1.98

813..... 7.95 85W7..... .89

CATHODE RAY TUBES

3BP1..... \$2.49 5GP1..... \$2.95 5HP4..... \$3.95

5BP1..... 2.95 5BP4..... 2.95 5FP7..... 3.95

FL-8 Audio Filter (new)..... \$1.79

Add 40c for postage.

DC Ammeter 60-0-60 (new)..... .97

CHOKES FOR MEDIUM POWER "B" PLUS

SUPPLIES..... \$1.49

10 henries @ 150 ma. 2.19

10 henries @ 200 ma. 3.19

FILTER CONDENSERS OIL FILLED

2 mfd. @ 600 volts, 3 for..... \$.49

10 mfd. @ 600 volts, 3 for..... 1.19

1 mfd. @ 1000 volts, 3 for..... .49

8 mfd. @ 2000 volts, 3 for..... 3.49

2 mfd. @ 2500 volts, 3 for..... 2.39

1 mfd. @ 3000 volts, 3 for..... 2.95

1 mfd. @ 4000 volts, 3 for..... 3.49

2 mfd. @ 4000 volts, 3 for..... 4.95

3 mfd. @ 4000 volts, 3 for..... 5.45

2 mfd. @ 5000 volts, 3 for..... 5.95

Remittance with Order. Minimum Order \$2.50.

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Don Lee Studios

(Continued from page 37)

vey the traffic problem and equipment needs of the expanding network. The outgrowth of many round table discussions was master control equipment with a switching system of over 800 possible program combinations requiring 821 relays, 49 amplifiers, 850 indicator lamps, 2500 jacks, and 13 volume indicators. The equipment contains facilities for handling 12 studios, 3 announce booths, 4 recording channels, 4 simultaneous remote programs, 96 remote connections, 7 incoming networks, 10 outgoing networks, and equipment for special facilities. Despite the complexity, there are tell-tale indicators, automatic features, and convenient control arrangements to permit its entire supervision by only one man.

In regard to the automatic features, it is normal to allow 20 seconds after cue for fill to the network before switching, permitting the master control operator only 10 seconds to perform his many functions. He now can press *Delay Master* buttons on cue, which will automatically switch the network 20 seconds later, leaving him free for other duties. The equipment has its own dust-free air conditioning system.

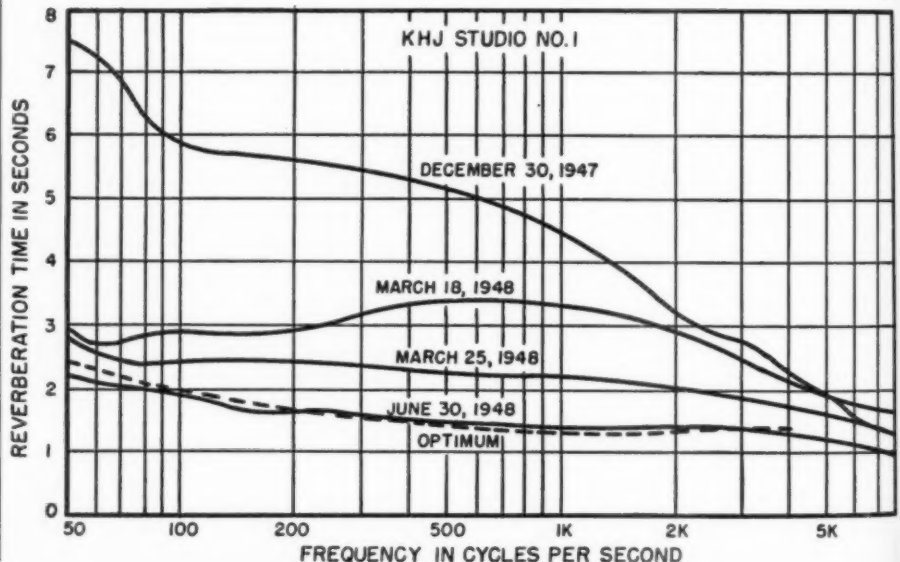
A mixing console which would incorporate facilities necessary to the needs of radio production had been planned for several years. Many schematics were drawn and revised. It was desired to have the greatest amount of flexibility and facilities for fulfilling the demands of all types of programs, but unfortunately the mixing console became excessively complicated. Often it has been said that an engineer's job is one of making the best compromise and here a compromise was necessary.

With this in mind, less frequently used special effect equipment was deleted with the idea of housing such equipment in a separate cabinet so that it could be wheeled to the side of any console when the occasion demanded. The desk circuits were treated to gain maximum flexibility through the use of jack bays. The eight channel mixer, operationally speaking, was simplified by keys, which, by choice of the technician, split the board into channel groupings controllable by sub-masters. On certain types of programs this greatly facilitates mixing. For example: the multi-microphone pickup of an orchestra, controlled by one hand, can be balanced against the instrumental solos or vocal microphones controlled by the other hand. The sound microphones can be balanced against the cast microphone in the dramatic programs.

Through the continual exchange of ideas with *Western Electric Company*, there emerged a control desk which in one year of trial installation has proven very satisfactory. The readily accessible plug-in amplifiers have made the occasional service requirements very simple.

The equipment installed in the KHJ network and FM announce booths is to provide for fading into or out of programs, giving identification and spot announcements, playing transcribed commercial spots or recorded fills in case of program failure, and cueing and monitoring necessary to the operation. The Don Lee Broadcasting System production department and announcing staff studied the possible layout of equipment fulfilling these needs with the intention of improving the ease and accuracy of operation. The number of controls appearing on the equipment was held to a minimum to avoid confusion and the placement was based on frequency of use. Much consideration was given to the slope

Fig. 1. A typical family of curves resulting from reverberation tests made during the course of construction. Here, for the first time, a building was constructed to the optimum reverberation characteristic as indicated by the curves.



of the control panel and location of the volume indicator to further facilitate operation. It was decided that a control desk similar in shape to that developed for the small studios would be ideal with circuit and control modification for use in the announce booths.

A need existed for control room equipment associated with the small studios used in commentary and round table discussion types of programs, preparation and playback of delayed broadcasts with facility for cut-in announcements, and assembly of record shows with the announcer (disc jockey) working in the control room or in the studio with a technician at the controls.

The design philosophy was that of simplicity, ease of operation, and dependability. With an intent to minimize operational errors resulting from poorly placed and excessive numbers of controls and switches, a careful study was made to determine the most frequently used controls and the most convenient location for each with the least hazard to smooth operation. The aim was to satisfy program production demands with the minimum number of controls in order to facilitate fast and accurate operation. To insure greater dependability, each part was studied as a potential trouble maker. For ease of operation, two turntables were built into one side of the desk, and a third was placed in a separate cabinet on the other side of the operator as optional equipment. Moreover, the physical shape and color of the control desk were worked out with Western Electric engineers to give eye appeal and modern design rather than just the "technical look."

Mutual Don Lee is convinced that the care and effort expended in the design and construction of this network center have produced the ideal home for its operations in Hollywood. The acoustic characteristics of the studios add measurably to the quality of the broadcasts. The provisions in the building for technical services and the careful planning of the layout for storage, for entrance and exit of the public, and for the managerial functions of the networks are of great value, and finally, the audio system brings simplicity and efficiency to program production and dispatching.



May, 1949

SEE THE BACK COVER

Since RADIO NEWS covers are printed far in advance of the balance of the publication, certain changes have taken place after our announcement on the back cover was printed. These are as follows:



All Major Components are Already Mounted on Chassis including prewired "VIVIDEO" I.F. strip (Pat. Pend.) and prewired front end. Only 13 tubes remain to be wired.

FREE! Complete comprehensive Service Data on the T.A.C. exclusive "VIVIDEO" 13-tube Picture and Sound I.F. Strip (Pat. Pend.). Contains all information needed to thoroughly understand and service this unique high-gain I.F. Strip which features 5½ stages of Cathode-Coupled Grounded-Grid Video I.F. amplification. For high gain, sensitivity, stability, "VIVIDEO" can't be beat! Write for FREE booklet SB-1 or ask your local jobber for it. Booklet SB-1 also included with each T.A.C. Direct-View Assembly.

NEW LOW PRICES!

T.A.C. STANDARD MODELS 29 RCA tubes, plus RCA or DuMont C.R. Tube. Pre-wired "VIVIDEO" 13-tube Picture and Sound I.F. Strip with 5½ stages of Picture Amplification. Pre-wired All-Channel Front End with Fine Tuning. RCA 5x7 Oval Heavy Duty PM Speaker. Delivered complete with ALL MAJOR COMPONENTS MOUNTED. PLUS New Comprehensive SUPER-SIMPLIFIED DATA for Wiring and Servicing.

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Model F101S—Complete with 10" RCA C.R. Tube **\$203.50** Dealer's Net*

Model F121S—Complete with 12" DuMont C.R. Tube **\$231.25** Dealer's Net*

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Model M101C—Complete (less C.R. Tube) **\$209.50** Dealer's Net*

Model F101C—Complete with 10" RCA C.R. Tube **\$243.75** Dealer's Net*

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Model F151C—Complete with 15" DuMont C.R. Tube **\$357.35** Dealer's Net*

Model F201C—Complete with 20" DuMont C.R. Tube **\$566.75** Dealer's Net*

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Always on guard against commercial power failures, Onan Plants equipped with Line Transfer Controls automatically take over the job of supplying electricity during emergencies. Upkeep costs are negligible. Only periodic servicing and inspection are required.



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FOR STANDBY FOLDER

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PK-36 (Projection video chassis).....	\$180
LK-36 (Projection low voltage power supply).....	76
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CK-36 (Projection Schmidt optical assembly).....	294
Complete	TOTAL \$605
PBK-36 (Optical barrel assembly) only.....	\$98

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RCA 630TS type chassis.....\$165.50
The tried and true chassis adaptable for use with 10", 12", 12 1/2", 15" and 16" tubes.
Send check with order or 25% deposit on C.O.D.'s. Prices quoted F.O.B. factory.

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I.F. COILS 455 KC (1 1/2"x2 1/2").....	3 for .99
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COMBINATION KIT—All Above Items—Only.....	10.00

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Write for Monthly Coupons and Bulletin

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Mac's Service Shop

(Continued from page 52)

tion that ordinarily separates the line from the chassis? What's the resonant frequency?"

"Let's see if you can figure it out for yourself," Mac suggested. "First, what's the chief characteristic of a series-tuned circuit?"

"A very low impedance at the resonant frequency," Barney said promptly; "so I suppose that this circuit is for the purpose of furnishing a very low impedance path between the chassis and 'B-minus' at one particular frequency."

"So far, so good!" Mac encouraged. "And what particular frequency is it that we want to be sure is tied down so that it cannot go wandering around through the receiver and cause us more trouble?"

"The i.f. frequency?" Barney guessed.

"That's right. Because of the high gain of the i.f. amplifier, it is essential that the i.f. signal stick strictly to the path intended for it. The series-tuned circuit is usually mounted physically near the cathode return of the i.f. amplifier, and so it serves to prevent degeneration at the i.f. frequency as well as to prevent oscillation. In short, you might say that the series-tuned

circuit is employed as a particularly effective bypass."

"It is rather funny that you should ask about that at just this time, though," Mac continued, "for this letter I am holding contains a descriptive bulletin on the *Sprague* line of resonant condensers that were designed to contain in a single compact unit that tuned circuit you have there. These condensers, which come in .05, .1, and .2 μ fd. values, have built-in inductance so that they resonate at 455 kilocycles. At this frequency, the impedance of a typical .2 μ fd. unit is less than a quarter of an ohm."

"If a fellow had to replace one of those resonant condensers, he ought to use an exact duplicate, right?"

"Right!" Mac said. "For if he doesn't, he is likely to have oscillation trouble."

"Do they look any different from ordinary condensers?"

"Well, the ones that bear the *Sprague* name come in yellow tubes and are marked 'resonant' for identification. The other day, though, I ran across one of the units that was in a slate-gray tube and just had the word 'special' stamped on it."

Barney shook his head sadly. "It is not enough that we have resistors that look like condensers and condensers that look like resistors. Now we gotta have tuned circuits that look like condensers yet!"

-30-

A USEFUL SWITCHING CIRCUIT

By JACK D. GALLAGHER, W5H2B

AN ARTICLE by the writer which appeared in *Radio & Television News*, June 1948, entitled "Another Method of Power Supply Control" presented a simple solution to the problem of turning the plate voltage on last and off first by three switches. For reference, the switching arrangement is shown in Fig. 1A.

Removing S_3 of Fig. 1A will provide a method of "plates on last, off first" for T_1 and T_2 . Suppose, however, that these same features could be accomplished with just one toggle switch instead of two. Or, if all three transformers were to be used, it would still simplify matters if two toggle switches would serve the purpose of three.

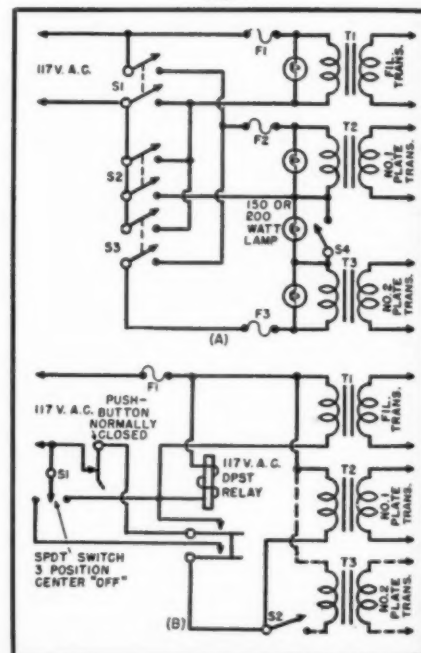
The diagram of Fig. 1B will serve the purpose quite well. The relay is connected in a lock-up circuit by throwing S_1 to the right. Since only a momentary connection is needed to turn on the filaments, S_1 can be a 3-position switch with a momentary action on one side. By switching S_1 to the left, primary voltage can be applied to T_2 . If S_1 were switched to the left at first, nothing would happen since the primary of T_2 is open through the relay contacts. If for some reason S_1 is to the left and the relay coil goes open, T_2 is turned off as well as T_1 , both simultaneously. If the plate voltage is left on (S_1 to the left) accidentally, the push-button will turn off both voltages.

S_2 in Fig. 1B controls T_3 , if it is used. Since the filament voltage must be applied before either T_2 or T_3 will operate, there is no possibility of turn-

ing the plate voltage on first, or off last. If both S_1 and S_2 were "on" (T_2 and T_3 operating), all voltages would be turned off when the push-button was opened and nothing could be turned on first except the filament transformer T_1 .

-30-

Fig. 1



International Short-Wave (Continued from page 142)

Azores—CSX2, 4.845, Ponta Delgada, heard 1715-1900; CS9MB, 11.090, heard 1415-1500. (Peddle, Newfoundland)

Barbados—VPR-9, 15.035, heard recently calling VRR-4 at 0740; heard another day 0745 contacting same station. (Ferguson, N. C.)

Belgium—Brussels, 17.845, heard recently calling ABC, New York, at 1730. (Beck, N. Y.) ORG, 19.230, heard to LSMS at 1300. (Peddle, Newfoundland)

Bermuda—ZFD-2, 10.390, works WNB; ZNX-2, 20.715, works London, and ZNU-4, 10.150, works WNB; all located at St. Georges. (Peddle, Newfoundland)

Brazil—Radio Jornal do Comercio, Recife, confirmed report via registered airmail QSL card. Transmitter is Marconi SWB 10, input 15 to 20 kw, high-level plate modulation. Antennas are 258 degree Beverage array for 19-, 25-, 31-, and 49-meters. Input at time of report was 15.18 kw. Stations, frequencies, and schedules listed PRL-6, 780 kcs., 0600-2100; ZYK-2, 15.145, 0600-1400; ZYK-3, 9.565, 0600-1200, 1400-2100; ZYK-2, 6.085, 1600-2100; advised that ZYK-3 also operates at times on 11.825 but is subject to heavy QRM there. (Rosenauer, Calif.)

What appears to be PYZ-2, *Emissora do Distrito Federal*, Rio de Janeiro, on 9.220, is heard 1800 or 1815 to 1830 sign-off. (McPheeters, La.) Also heard in Texas by Stark.

British Guiana—ZFY, about 5.985, Georgetown, heard in New York at 2000 and signing off 2045 with "God Save the King." (Weisberg) Relays BBC news 1800. (Ferguson, N. C.) Good level early mornings, also.

British Honduras—Ferguson, N. C., says ZIK-2, 10.598, Belize, seems to be back on old schedule as has heard it opening several times lately 1332 with news; was heard one day 1250 calling VQNA at 1331, had news which ended 1343, then called VQNA again; fair signal.

Bulgaria—Radio Sofia, 7.671, is still broadcasting 2250-0300; no English noted; improved signal recently. (Hagen, Ala.) Has setting-up exercises 2320, Eastern music 2330, news in Bulgarian 0000, then music (this time mostly marches of Slovak type). (Beck, N. Y.) Is heard in Newfoundland 1650-1700 with news. (Peddle)

Cameroon—"Ici Radio Douala," 9.160, signs on 1300 with march, then gives call "Allo, Allo, Ici Radio Douala"; programs feature much recorded music. (Pearce, England) On Sundays appears to run 1430-1600. (Peddle, Newfoundland)

Canada—VE9AI, 9.54, Edmonton, Alberta, has news 0000. On West Coast, says Dilg, Calif., can be heard at weak level mornings after *Radio Australia* leaves the channel 0845.

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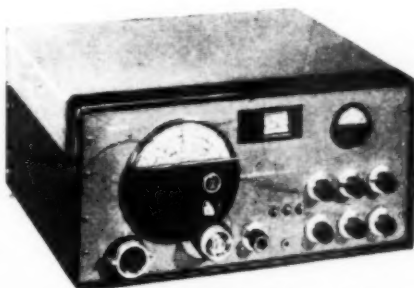
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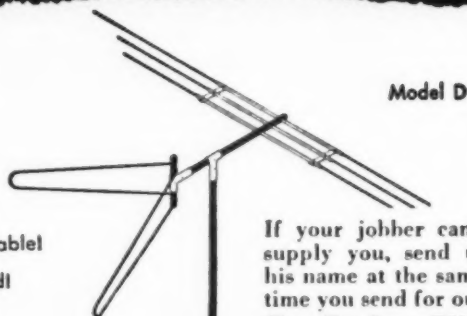
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has received verification (making his 208th country verified!) from *Radio Clube De Cabo Verde*, Praia CR4AA, heard on 5.910 some months ago; sent a beautiful card, gave frequency 6.024 and schedule of 1350-1500; however, Pearce, England, lately heard this station to 1700 on approximately 5.895 through bad CWQRM; DeMeyer heard it on 5.910 at 1600-1700. Swedish sources list this one with only 100 watts.

Ceylon—*Radio Ceylon* was recently heard at 1100 on 15.12 and 17.73 (not 17.77). (Balbi, Calif.) Has BBC news relay 1100 and some days is readable here in East on 15.12. The Sunday transmission to the British Isles is best in East now on the 16-m. outlet, since 15.12 at that time suffers severe QRM; time 1130-1330.

China—Nanking's former XGOA, 9.730, no longer giving call, still heard in California 0900 with usual news. (Dilg) This outlet is fair level in West Virginia early mornings, but usually has interference from around 0625. Balbi, Calif., recently heard the 9.730 channel 0500-0730, all native, strong level, but says there is no sign of the 5.985 outlet now.

A Communist-controlled outlet on approximately 7.500 was recently heard by Dilg, Calif., with *English* starting shortly before 0900; may be old XNCR.

GDX-AREN, house organ of Göteborgs DX-Klubb, Sweden, reports "*Shanghai Broadcasting Station*" heard 0900-1000 sign-off on 11.705. (I am anxious for full details on current frequency and schedule of former XORA, Shanghai.—K.R.B.)

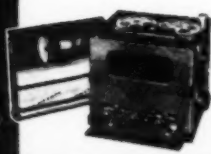
BCAF, 8.995, is believed to be old XGAF, Nanking Air Force, moved from 7.102. (Dilg, Calif.)

According to data received directly from the station, *Radio Hong Kong* has two m.w. transmitters of 2 kw. and one s.w. transmitter (ZBW-3) of 2.5 kw.; frequencies are ZBW, 645 kcs., transmitting the *English* Program 2330-0100, 0500-1015; ZEK, 640 kcs., transmitting the Chinese Program same hours; ZBW-3, 9.52, carrying the *English* and Chinese Programs of ZBW and ZEK at same hours listed for m.w. outlets. But on Sundays, the *English* Program starts 2 hours earlier, that is at 2130, and Chinese Program begins Sundays one-half hour earlier, that is 2300 (Ghurkali Program). The s.w. outlet, 9.52, is shared between *English* and Chinese Programs. News scheduled 0015; BBC's, GOS relay of world news and news analysis 0600; BBC's GOS relay of "*Radio Newsreel*" 0900. Summer time schedule listed *English* 2200-2330 (Sundays) and other days 2230-2330, 0530-0630, 0715-0915, and Chinese at 2330-0000, 0400-0530, 0630-0715. (Gaynor, Calif.)

XGYA, 7.990, heard 0530 with relay of XNCR in Chinese news, music. (Sanderson, Australia)

Desouza, Singapore, says North Shensi New China Station is heard on 9.000 from 0430 to 0900; no call-sign heard; has news 0845 to closedown at

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1L4	6AU6	68D7	12AT7	12H6	46
1Q5	6BA6	68F5	12AU6	12J5	47
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which time identifies; reception very poor. (Radio Australia)

Colombia—HJCX, 6.020, Bogota, has returned to the air; was off for a while following revolution in that country. (Beck, N. Y.) HJBB, 4.815, Radio Cutcuta, heard 0500-2200. HJGF, 4.845, Bucaramanga, signs off 2230 giving sign-on as 1300. (McPheeters, La.) HJKJ, 6.160, good signal, identifies in Spanish 1900. (Hankins, Pa.) Bogota, 11.68 (measured 11.6825) fair signal 2015-2120; HJCT, measured 6.199, Bogota, good level 2300-2310 sign-off.

Cuba—CMQ Network (which operates COCQ, 8.700), recently acquired two new announcers, Alberto Gandero and Francisco Forcade, both of whom have been for several years on the NBC staff in New York. CMQ Network won the 1948 Cuban radio awards for the best dramatic program (El Derecho de Nacer), the best actor and actress, the best comedian, the best announcer, the best news commentator, and the best program of service to the Republic of Cuba. (Bachman, Pa.)

Cyprus—Sharq-al-Adna, 6.135, 6.170, 9.650, all good 2255 sign-on; 6.135, 6.170 fade out around 0015 but 9.650 is heard with fair to good level to sign-off 0130. (Beck, N. Y.) The 6.790 channel is scheduled in parallel. Latter is heard in Newfoundland by Peddie at 1400-1445.

Forces Broadcasting Service, Kakatamia, 7.220, continues to test Saturdays 1700-1900, answers listeners' reports that day 1800-1815, and asks for reports "from anywhere." (Pearce, England)

Czechoslovakia—Hagen, Ala., says "The only time I have been able to receive Prague is on 11.760 between Melbourne's transmissions—at 1115-1200, that is—broadcasting news in various languages." At the time this was compiled, the daily North American transmission 1850-2000 was on 9.550, excellent at start but soon

A regular, valuable contributor to ISW is D. W. McPheeters, Louisiana, who relaxes here as he tunes his National Receiver, Mac, who is a member of the Romance Language Department at Louisiana State University, is quite handy in translating material for your ISW editor.



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QRM'd by Paris; last 20 minutes is a relay from Bratislava; news 1900. *Radio Australia* reports the 11.840 channel has been heard in Australia around 0045, closed down 0103.

Denmark—OZF, 9.52, Copenhagen, often heard with news 2230, good signal. (Ferguson, N. C.) According to announcement, uses 15.165 on Tues., Thurs., Sat. 0500-0600 to Far East. (Huse, Washington) It is believed this is the new 50 kw. transmitter which is used other times on 9.52.

Dominican Republic—H12A, Santiago, checked recently on 9.682, signing on 1450 with announcements in Spanish. (Ferguson, N. C.)

Ecuador—Clayton Howard, engineer at HCJB, Quito, informs that operations have been expanded on the 16-meter channel. Is now on the air daily except Mondays on 17.890 with 10 kw. and beamed to Europe 1200-1545 (Sundays begins 1130). The station desires reports from European listeners, and believes reception in Europe will "pick up" as summer comes on.

Finland—Helsinki, 15.19, still has news daily 0715 but now suffers terrific QRM from AIR, Delhi, same channel. Balbi, Calif., says the 2200-0000 transmission is heard with excellent strength. Fargo, Georgia, reports this one at excellent level 1145-1245, all-Finnish.

France—European Service of Paris on 7.280 signs off 1600. Paris heard 1515-1645 on 9.680, 11.845 to French East and Equatorial Africa. (Beck, N. Y.) The 15.350 channel heard in French from tuning 1130 to sign-off 1213, good signal. (Ferguson, N. C.)

French Equatorial Africa—Radio Brazzaville, 9.440, 9.984, 11.972, is scheduled 0000-0230, 0500-0745, 1100-1700, 1705-1825, 1830-2000; sometimes 6.024 is in parallel as at 0000-0230 and 1705-1825 periods; 17.840 is in parallel except at 1600-2000. In recent DX session, Leopoldville gave call letters of Brazzaville as FZ1 (not FZ1). (Beck, N. Y.)

French Indo-China—Radio Saigon, 11.78, heard with news 1830, announces next news for 1930. (Pearce, England) The 1830 period is heard here in West Virginia, but soon is buried in QRM. Balbi, Calif., reports 6.10 and 7.21 in parallel with Saigon's 6.165 to 1030 sign-off.

Sanderson, Australia, still lists Phnompenh on 12.36 at 0530 with Chinese news at dictation speed, then music; she gives *Radio Dalat* on 6.18 at 0700 with news in French, fair signal, and Saigon on 7.21 at 0545 with news in French.

French Morocco—Radio Maroc, 6.005, Rabat, heard 0150-0215 fade-out in Ontario with Arabic program. (Alfred) Heard in Arabic 1530-1600, in French 1600-1630. (Paddle, Newfoundland) Has news in French 0300.

French West Africa—Radio Dakar, 11.898, heard well from 1315 to 1700 sign-off after headline news in French; Saturday and Sunday is heard to 1800. (Pearce, England) Heard in Newfoundland 1330-1700. Dakar is

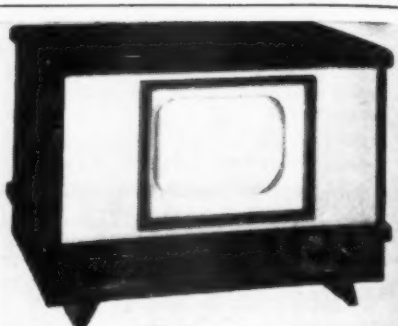
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RADIO & TELEVISION NEWS

heard on 15.405 some days phoning Paris 1015. (Peddle)

Germany—Leipzig, 9.728, heard opening 2258. (Stark, Texas)

DTFC, 15.105, Munich, heard point-to-point and with relay to "Voice of America" in New York 1030-1100, good signal. (Sutton, Ohio)

Stuttgart recently heard 0845 on 6.030, moved from 6.180; has news in German 1145. (Pearce, England) Sweden confirms this change in frequency. (Swedish DX)

Gold Coast—Kumlin, Sweden, has heard ZOY, 4.915, Accra, at 1235-1302 with program of native songs, then news in English (1800), announced, and then signed with national anthem; QSL card received.

Greece—Hagen, Ala., says Athens, 9.605, runs to 0315 on Sunday with all-religious program; some days signs on 0000, others 0030. Beck, N. Y., comments that now has fine modulation but that there still is a slight hum on the channel. Reports from various points in East indicate improved signal from Radio Athens, 15.345, in daily period to North America 1730-1830, news at start.

Pearce, England, reports "Hona Larissa Radio Fonikos Strathmos" on 6.740 daily to closedown with march 1430; asks for reports to The Greek Democratic Army Broadcasting Station, Larissa, Greece; heard signing on 1100; has some Arabic, some Western programs. Nattugulan, Sweden, comments that announces in French and English. Heard by Peddle, Newfoundland, 1230-1500. (Closedown may be irregular in view of above reports.)

Holland—PCJ, 21.48, heard opening in Dutch 0943 and closing down 1031 with Dutch National Anthem, good level. (Ferguson, N. C.)

Eddie Startz of PCJ informs me that by this time the new 40 kw. transmitter should be in operation; station is on a field near the small town of Lopik close to city of Utrecht where one of the Home Service transmitters is located.

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India—Delhi, 15.79, has recently been good level here in West Virginia late mornings to closedown 1230; has last news 1215.

On Saturdays there is a program of request musical selections at 1000-1030 on 9.590 and other AIR channels in use at that time. (Rosenauer, Calif.)

Indonesia—Radio Indonesia, 19.345, Batavia, is heard well now 1100-1300 (may sign off 1230 some days); 15.150 is in parallel although some times is buried by BBC on an adjacent channel. (Fuller, R. I.) I note that on the

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19.345 outlet there are frequent announcements in both Dutch and English. Recently, the Batavia outlet on approximately 11.000 has been fairly good here in West Virginia for the 0600-0700 English period; 15.150 is in dual.

Pearce, England, has heard *Radio Indonesia*, 15.150, Batavia, at 1800 with clock striking; often has North American recordings from 1800, and has been heard from 1745 after sign-off of US station on that channel.

Balbi, Calif., recently noted an Indonesian on 9.78, signed off 1000; believes might be *Radio Sario* moved from 9.72.

Radio Indonesia, 9.550, Makassar, heard recently on West Coast 0900-1000 sign-off, good level, musical program, announcements in Dutch. (Rosenauer)

Rosenauer, Calif., flashes that he has recently been hearing a new Indonesian on approximately 11.110, first heard 0900-1000 sign-off with good signal; program was music; at close clock strikes eleven and station then signs off with Bing Crosby's recording of "Just a Prayer Away"; another day was heard 0600-0700 with announcements in Indonesian and Dutch.

YDH-2, 11.034, Semarang, heard 0800-0830. (Alfred, Ontario)

Iran—Nattugglan, Sweden, reports Khoramabad on 6.845 at 1130-1230 on two days of the week (probably Monday and Thursday). A recent Swedish DX session from Stockholm said the Regional Broadcasting Station for the province of Fars at a place called Shiras is transmitting on 7.960 Mondays and Thursdays 1130-1200; heard in Sweden.

EQC, 9.680, Teheran, heard around 2330; all-Persian. (McKay, Fla.) I checked this channel and found a station opening there 2330; seemed to

have news in Persian 0000; rather strong signal.

Teheran, 15.100, is usually good level in daily 1340 newscast.

Israel—In verifying for DeMyer, Mich., Kol-Israel, Tel Aviv, listed frequency of 6.820 scheduled 2345-0100, 0430-0715, 1015-1530, news 0700, 1500. DeMyer hears this one well from 0000.

Italy—Rome still has English session 2015-2055 with news 2015, good on both 9.630, 11.810. (Beck, N. Y.) Heard on 9.630 at 1510 in foreign language; at 1515 announced program of Arabic; at 1544 announced in English and gave news, ending English period 1630, continued in Italian. Heard on 11.810 closing program for Latin America 1935 and leaving air. (Ferguson, N. C.)

Jamaica—ZQI, 3.480, Kingston, heard 2100-2200. (Peddle, Newfoundland)

Japan—Tokyo, 9.505, heard 0545, fair signal. (Alfred, Ontario)

Here are current Japanese calls, frequencies, and schedules as received airmail from Howard H. Boyle, Tokyo, Chief Engineer with AFRS.

1st Network—JKH, 7.257.5, Yamata, 5 kw., 1525-0900; JKI, 4.910, Nazaki, 5 kw., 1555-1715, 0255-0900; JKI-2, 9.655, Nazaki, 5 kw., 1725-0245.

2nd Network—JKJ, 7.285, Nazaki, 5 kw., 1625-1800, 0255-0900; JKM, 4.930, Kawachi, 5 kw., 0255-0900; JKM-2, 9.695, Kawachi, 5 kw., 1625-1800.

Repatriates—JBD, 9.505, Kawachi, 7.5 kw., 0255-0900; JBD-2, 9.560, Kawachi, 5 kw., 0455-0900; JBD-3, 15.225, Kawachi, 7.5 kw., 1730-0245; JBD-4, 15.235, Kawachi, 5 kw., 1750-0245.

AFRS—JKK, 6.015, Nazaki, 5 kw., 1615-0907; JKL, 4.860, Yamata, 5 kw., 0355-0907; JKL-2, 9.605, Yamata, 5 kw., 1615-0345.

Korea—HLKA, 7.935, Seoul, often is R6-7 at 1630 with English lesson, presumably for Koreans.

FUSING HORIZONTAL OUTPUT CIRCUIT IN TV RECEIVERS

By MATTHEW MANDL

A COMMON trouble in television receivers having tubes larger than 7 inches has been the failure of the 6BG6 horizontal output tube. The high potential pulses present on the plate of this tube, due to the fly-back process of the high-voltage power supply, do much to produce ionization and cause the tube to go gassy more quickly than if it were used in other services. Once the tube goes gassy, excessive current flows through it, and this in turn will cause over-heating of the horizontal output transformer.

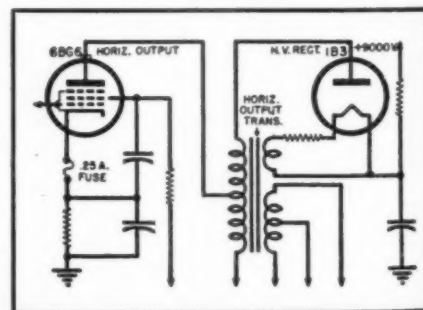
Most present-day sets have this circuit fused to prevent damage to the output transformer. A number of television receivers manufactured during the past several years, however, have no fuse in this circuit, and, in consequence, ionization of the 6BG6 will burn out the horizontal transformer if the receiver is not shut off in time.

When a television receiver is brought in for repair, this circuit should be checked and a fuse inserted if none has been included by the manufacturer. A .25 ampere fuse is sufficient to open the circuit when excessive current

flows through the tube. A No. 44 pilot bulb can also be used, since this has a rating of .25 amperes. A No. 47 bulb will also prove satisfactory and will usually glow dimly when the set is turned on.

The fuse can be inserted in several places in the circuit, though the easiest is probably the cathode circuit. The lead going directly to the cathode can be unsoldered, and the fuse inserted as shown in Fig. 1.

Fig. 1.



RADIO & TELEVISION NEWS

Lebanon—Radio Beirut, about 8.020, heard in New York 0045 with news, not sure of language being used. (Bel-
linton, N. Y.)

Luxembourg—Radio Luxembourg, 15.350, heard 0715 with sponsored program in French. (Ward, England) Is fairly good level in America, appears to end transmission 0835.

Malaya—Stark, Texas, recently heard Radio Malaya, Singapore, 4.825, identified 0800 (in English). A station he recently heard on 7.220 (in English) 0730 also appears to be Radio Malaya. Balbi, Calif., flashes that the 7.220 channel is strong on West Coast to 1030 sign-off, relays Blue Network. Also heard by Dilg, Calif.

Radio Malaya, Kuala Lumpur, is back on 6.025; heard on West Coast 0900-1045 fade-out, best 0900-1000; is in the clear now. (Rosenauer) If it is still audible in East during May, best time to try for it would probably be 0630 when usually has news. ISWC, London, lists call ZGE.

Manchuria—Harbin, approx. 7.099, now has news 0840 instead of 0800; Harbin announces frequencies of 7.100 and 3.500 on s.w. in addition to 2 m.w. outlets. (Dilg, Calif.)

Martinique—Hagen, Ala., says Fort-de-France, 9.700, can be heard well between transmissions of WLWS, Cincinnati, that is at 1800-1900, in French. Heard in North Carolina by Ferguson early as 1740.

Mauritius—Nattugglan, Sweden, says Mauritius is heard on 40.87 metres (approx. 7.340) to 1215 when signs off with "God Save the King."

Monaco—Radio Monte Carlo seems regular now at 1400-1500 on 9.495. (Peddle, Newfoundland) Swedish sources say the m.w. outlet has been changed to 959 kcs., and that the s.w. transmitters on 6.035 and 9.494 both operate with 25 kw. power. (Swedish DX)

Mozambique—CR7BE, Lourenco Marques, recently appeared back on 9.715 from 9.708. (Stark, Texas) Still later has been heard both 0000-0100 and 0900-1100 on approximately 9.750. Rosenauer, California, informs me that this channel (he lists it approximately 9.745) is heard 1045-1100 sign-off with fine signal; at 1100 asks listeners to tune to 60- or 85-meter band as the 31-meter channel closes down then; however, some days at least the 9.745 one runs late as 1105. In the 0000-0100 transmission, the frequency appears to me to be 9.750, fine level, English announcements.

New Caledonia—Radio Noumea, 6.000, can be heard after Rabat leaves 6.005 at 0300 until after 0500 when fades out; announces at 0500 as "La Voix de la France" and has all-French program. (Hagen, Ala.)

Rosenauer, Calif., has received a letter from Le Directeur du Cabinet du Gouverneur General, Directeur du Service de l'Information, Noumea, "La Voix de la France dans le Pacifique," Noumea, New Caledonia, in answer to airmail letter requesting confirmation of the change in fre-

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quency to 6.000 and any changes in schedule. The official advised that 6.000 is the correct frequency and that there has been no change in schedule as given earlier—1200-2000, 0230-0400. This does not quite match the time Rosenauer has heard this station, sign-off having been 0500. He inquired as to current power output but received no answer to this query.

New Zealand—ZL3, 11.78, logged early as 1255 with orchestra; at 1300 announced ZL3 and ZL4 (15.28) and took relay of news from BBC; generally has "Breakfast Music" 1315, another BBC news relay 1400, followed by weather forecast 1415. (Pearce, England) Is used widely for relay of m.w. outlets; final closedown now appears to be around 0620 on both 11.78, 15.28.

Nicaragua—McPheeters, La., received verification from YNMG, "La Voz de Jinotepe," 8.007; proprietor is a woman, Margarita E. Gomez; schedule is 1230-1400, 2000-2130 daily; suffers bad CWQRM; listed 100 watts.

YNDG, 7.660, heard 2000 announcing in Spanish and English, continued with music. (Ferguson, N. C.)

Northern Rhodesia—ZQP, Lusaka, heard in Ontario on 9.715 at 1030, high noise level, fast fading. (Alfred) Carl Rosenauer, Calif., has received a letter from Lusaka, signed by John F. Murray, the Broadcasting Engineer, in which it was stated:

"Although we are using a high angle, omni-directional aerial on 9.710, we have had a number of reports from California, Sweden, and Western Australia. It rather looks as though we have some secondary lobes at a low angle; until the field-strength measuring apparatus on order arrives, we can't do much about it. The power on 9.710 is 2.5 kw. into the aerial, which is of the Marconi 'Quadrant' type, that is, two half-wave sections at right angles to each other in the horizontal plane, thus giving an omni-directional horizontal pattern. The elements are a quarter-wave above ground so that, theoretically, there should be no low angle radiation. We are supposed to cover Southern Rhodesia, Northern Rhodesia, and Nyasaland from Lusaka, i.e. a five hundred mile radius centered on Lusaka, providing programs in the various vernaculars as follows—Monday 1000-1200 Chibemba; Tuesday 1000-1200 English for Africans; Wednesday 1000-1200 Chinyanja; Thursday 1000-1300 Silozi and Chitonga; Friday 1000-1200 Sindebele; Saturday 1000-1200 Euro-African Program; Sunday 0400-0530 European Program, and 1030-1130 African Religious Service. We also transmit on 7.220 and 3.914, but on 500 watts only on each of these frequencies." At press time, Rosenauer flashed to me that Lusaka now appears to be on about 9.700, at least is lower than Lourenco Marques and has good signal 1100-1130.

Norway—Worris, N. Y., has learned that "economic restrictions will limit short-wave transmissions to present

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scope during foreseeable future. Currency restrictions made it necessary to use temporary, makeshift, home-made components in parts of the new 100 kw. transmitter." However, I understand several additional antennas are being erected at the present transmitters to broaden the range of the stations.

Oslo's LLN, 17.825, heard 0800-0830 with call in *English* and Norwegian; asks for reports to *Radio Norway*, Oslo, Norway; says also operating in 19-, 31-, and 41-m. bands (LKV, 15.170, LLG, 9.610 fairly good but the 41-m. channel of 7.240 is jammed by locals at this time). Now frequently announces in *English* 1500 on LLG, 9.61, and then gives frequencies for 19-, 25-, 31-, and 41-m. bands. (Pearce, England)

LLK, 11.850, heard 0130-0235 sign-off, fair level. (Balbi, Calif.)

LLS, 7.210, heard 1400-1500; LKJ, 9.540, Tromsø, heard 0530-0615. (Peddle, Newfoundland)

Panama—HP5A, 11.695, Panama City, signs off 2245. (Beck, N. Y.) HP5B, 6.030, *Radio Miramar*, Panama City, now signs on a half-hour earlier, that is 0700; QRA seems to be Aptdo. 1214. (McPheeters, La.)

Philippines—Manila, 9.640, heard with station announcement 0700, gave new m.w. call of DZRH; sponsored dance session followed. (Ferguson, N. C.) This one heard recently in California at 1100-1130 with popular music and *English* announcements, good signal; call of s.w. outlet appears DZH2 (Rosenauer).

Portugal—Lisbon, 6.350, signs off 1900 in Portuguese to Brazil; formerly on 6.374; this is a different transmitter from the one used to North America on 6.374. (Beck, N. Y.) However, Pearce, England, says Lisbon is now using approximately 9.726 (instead of 11.027) at 1600-1800 for Brazil, with news in Portuguese 1605, 1745. May be using both 31- and 48-m. bands to Brazil.

CS2W1, 12.865, Parede, power 250 w., heard 1900-2000; QSL'd in 27 days from Radio Clube Portuguesa, Parede, Portugal; card blue with gold lettering. (Alfred, Ontario)

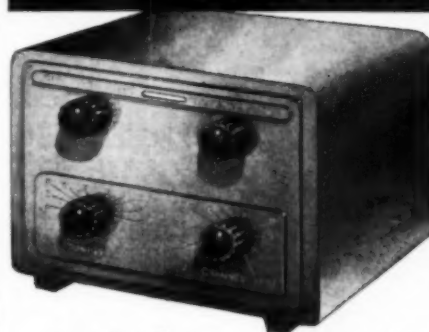
Portuguese India—From Nattuglan, Sweden, comes a report of a verification from "Emissora De Goa," Goa, giving current frequency as 9.610, with 500 watts power, and schedule of 0900-1000.

Portuguese Guinea—Bissau is definitely now on 6.997. (Kary) Has been heard on this channel at 1720 but has almost continuous CWQRM which generally blots out Bissau. (Pearce, England) Closedown remains 1800, when signs with "A Portuguesa."

Rumania—Bucharest, 6.210, heard 1510 with news and talk in *English*. (Ward, England)

Under favorable conditions, the 9.252 channel can be heard in East at 1600 when has news; sign-off is 1630 now; has severe QRM. Is heard in Newfoundland by Peddle at around 1430-1540. Kary notes that uses 7-note

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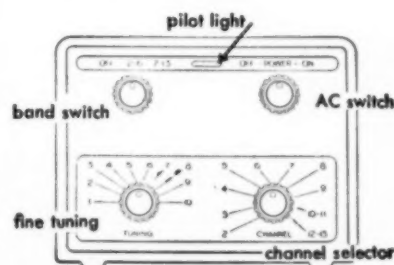
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chime for identification purposes 1530 and 1600, that schedule is now an hour later than formerly, and that closes 1630 with choral music.

Salvador—McPheeters, La., has received verie from YSR, "La Voz de el Salvador," 990 kcs. and 6.265; said using 900 watts on s.w. and 1,000 watts on m.w. channel; scheduled 1200-0000; also in network are YSF, Radio Vanguardia, 840 kcs. and 9.250; YSHQ, "La Voz del Progreso," San Miguel (first two are in San Salvador), 950 kcs. and 6.500; YSA, Radio Cultura, a new station to go on the air shortly, 1,020 kcs. and 9.490, located at Santa Ana.

YSUA, 6.250, uses recording (in English) to announce call on half-hour and then returns to Spanish; announces "Radio Mil Cincuenta"; appeared recently to be holding some sort of contest for listeners. (Weisberg, N. Y.)

Siam—From Johnston Island in the Pacific, Capt. F. Fellers informs me that the Overseas Broadcasting Station of Siam, Bangkok, now testing on 11.715 daily 0500-0630 in parallel with 6.010, has been heard by him on 11.715 with news 0515, English talk 0540, and news again 0615; signal good but has QRM from Australia's 11.71 and USA and Moscow; he cannot hear the 6.010 outlet due to terrific QRM from Noumea and South America. The 49-m. outlet, however, can be heard some days here in East in 0615 news; the 11.615 channel is "all noise" here in West Virginia 0500-0630. Reception reports on the 11.715 tests are requested, according to Desouza, Singapore, via Radio Australia.

South Africa—Pearce, England, says most reliable signal he has been getting from South Africa is Johannesburg, 4.895, heard from around 1230 to sign-off with "Suid Afrika" and "God Save the King" 1605, following the "11 p.m. Epilogue." Programs are all-Afrikaans; news in Afrikaans at 1500; English program on 4.800 at 1245 has poor intelligibility due to CWQRM.

Cape Town, 5.878, has had improved signal lately here, opening 2345 with English announcement, then goes into Afrikaans (setting-up exercises).

ZRB, 9.11, Pretoria, heard well recently, in clear, 0010 with setting-up exercises. (Bellington, N. Y.)

Spain—Radio SEU, EDV10, Madrid, is now back on 7.191 at 1400-1900. "La Voz de la Falange," 7.380, Madrid, has Spanish 1400-1530, 1700-1830, and French 1330-1400; much QRM from Moscow. Radio Mediterraneo, Valencia, verified by (English) letter, gave frequency 7.037.2, scheduled 0700-1000, 1400-1800; opens with march "Hacia Valencia," closes down with "Marcha de la Ciudad." (Pearce, England)

Surinam—PZC, 15.405, has Arabic Fridays 1900-1945 in parallel with PZH-5, 5.760. (Alfred, Ontario)

Switzerland—The Home Service from Berne at 0040-0140 is now on 6.165 (100 kw.) and 9.535 (instead of former 11.715). Berne signs off 1530 on 11.865 and 9.665 (new 100 kw.) in British Isles beam; returns 1545 on

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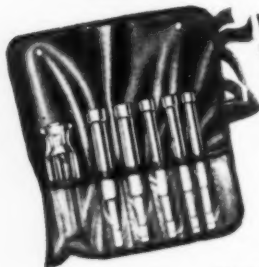
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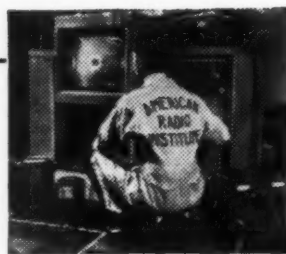
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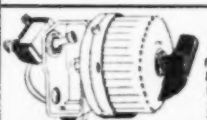


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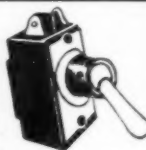


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given; QRA Aptdo. Postal 76. Mc-
Pheeters lists new call of *Radio Caro-*
ra as YVMU, 3.340, signs off 2130; says
YVMG, *Radio Popular*, 4.810, Mara-
caibo, is scheduled 0600-2230; that *Radio*
Maracay, 3.430, appears to sign off
usually 0800; new callsign appears to
be YVLI for the s.w. outlet and YVLJ
for 930 kcs.

Yugoslavia—YUA, 6.107, Belgrade,
has English 1545-1600. (Peddle, New-
foundland)

Unidentified—Alfred, Ontario, would
appreciate identification of a station
heard on approx. 9.560 at 2015 with
tom-tom drums and African-type
program.

An unidentified station on 6.150 has
Arabic around 2300 and later; defi-
nitely is *not* Sharq-al-Adna which is
heard on 6.170 with slightly better sig-
nal. (Beck, N. Y.) This may be Tehe-
ran, Iran, listed 6.155V.

Last-Minute Tips

"*Ici Radio Algiers*" was heard in
February on 15.200 both during Arabic
before 1500 and French from that
time, same program as *Radio Algiers*,
9.570; occasional breaks in program;
not heard since so may have been a
test or a spurious transmission.
(Pearce, England)

In a recent Swedish DX session
from Stockholm it was reported that
Jerusalem, 8.100, had *not* closed down
as previously reported but had been
heard 1330 when carrying same pro-
gram as Kol-Yisrael, 6.820, Tel Aviv.

A station heard opening 0000 on ap-
proximately 8.017 is believed to be
Radio Beirut, Lebanon; has had QRM.
(Stark, Texas)

Radio Makassar, Celebes, heard re-
cently on 9.550 from tune-in 0715 to
fade-out 0900, mainly in Indonesian-
Malay; the 11.086 channel was some-
what weaker, faded out earlier, and
did *not* carry same program as 9.550.
(Kary)

A new s.w. transmitter at Waneroo,
Australia, to be used in Inland Service
of ABC, may be operating around the
middle of this year. (*Radio Australia*)

Nattugglan, Sweden, lists Hyderabad
(India) on 6.110. *Can anyone con-*
firm?

COKG, Cuba, runs 500 watts; QRA
is Apartado 82, Santiago de Cuba,
Cuba. (Weisberg, N. Y.)

A Czech listener reported recently
to *Stockholm Radio* that *Radio Vene-*
zia Guilia is a clandestine (Italian)
station operating on 6.400, signing off
1500. (Swedish DX)

Desouza, Singapore, reports "*The*
Voice of Sumatra" on 7.620 daily 0730-
0830; Javanese 0730-0800, news 0800,
last 15 minutes in Indian dialect.

Hankins, Pa., has received verifica-
tion stating *definitely* that *Juliana*
Sender, Willemstad, Curacao, has been
operating on 5.010 as well as 2.315
since December 1, 1948; the 5.010 is
the exact frequency reported by Han-
kins. Manager of station CUOM,

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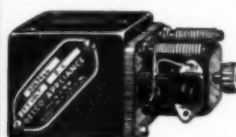
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Jan Doedel, stated "our broadcast in English is now Mondays 2000-2015." The 5.010 outlet is also reported heard by Peddle, Newfoundland.

Ferguson, N. C., received this data from Direction Centrale de la Radio-diffusion D'Albane, Rue Conference de Peza 3, Tirana, Albanie; *Radio Tirana*, ZAA, 7.850, scheduled 1300 news in Russian; 1315 news in Roumanian; 1330 news in Italian; 1345 news in French; 1400 relays with m.w. for re-broadcast the news in Albanian; 1415 news in Greek; 1430 news in Bulgarian; 1445 news in Turkish; 1500 news in Serbo-Croat; 1515 news in English; 1530 program for Albanians abroad; 1600 end of transmission.

In a DX broadcast from Leopoldville this data was given concerning *Radio Congo Belge*—OTM-1, 6.295, 0000-0200, 0500-0700, 1100-1500; OTM-2, 9.380, 0000-0200, 0500-1500; OTM-4, 11.720, 0515-0700; broadcasts in French, Spanish, and Portuguese to Europe. OTH was given on 9.210 at 1230-1330 in French and Congo dialects, power 15 kw. QRA is Radio Congo Belge, P. O. Box 171, Leopoldville, Belgian Congo. (Novomestky, Puerto Rico, and Cooley, Pa.)

Wooley, N. J., flashes that Denmark's 9.52 is now fine strength at 2015.

McPheeters, La., recently reported hearing Podebrady, Czechoslovakia, on 11.900 around 2300-0100, appeared to use trumpets played on Praha II. OLR4D, Prague, is listed 11.900 as "inactive."

The *Azad Kashmir Radio*, 6.230, Rawalpindi (with transmitter at Trakhel) has not been reported for some time and is presumed to be off the air. This is probably the station referred to abroad (near end of 1948) as believed to be *Radio Pakistan*.

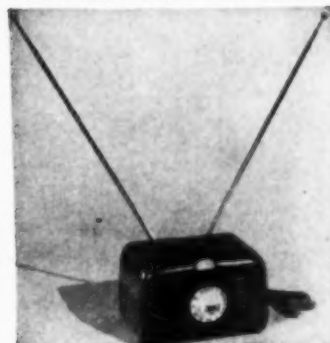
The Government of India is progressing in its Eight-Year Plan for expansion of broadcasting facilities. Many new high-powered stations (presumably on m.w.) are under construction and it is presumed some s.w. ones will be included in the plan. A news release from the Indian Embassy recently stated: "High-powered radio transmitters will soon be installed at Delhi, Bombay, Madras, and Calcutta. Pilot stations have already opened at Cuttack, Shillong, Gauhati, Nagpur, Vijayawada, and Allahabad. Giving further information on the government's eight-year program for the expansion of broadcasting facilities, the Information Minister said in Parliament on February 4 that a radio station at Ahmedabad would begin to function by the end of March 1949 and that pilot stations at Jullundur, Dharwar, and Calicut would be completed by June. The 8th new radio station of India since its independence went on the air on February 1 at Allahabad." (Joshi, W. Va.)

Acknowledgement

Thanks for the FB reports this month, fellows! Keep them coming to 948 Stewartstown Road, Morgantown, West Virginia, USA.—K.R.B.

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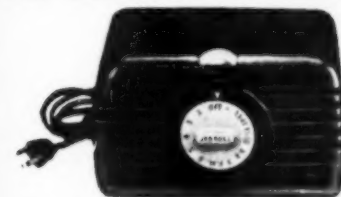
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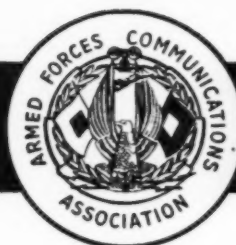
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AFCA CHAPTER NOTES

Baltimore

The March 3rd meeting of the Baltimore Chapter was held at Station WBAL of Baltimore and featured a broadcast of an address by Colonel Kirke B. Lawton, Deputy Chief Signal Officer of the Army, in commemoration of the 86th anniversary of the Signal Corps. Present as guests of honor were Admiral Earl E. Stone, Chief of Naval Communications, and Major General Francis L. Ankenbrandt, Director of Air Force Communications. At 6:15 p.m., Clinton H. Johnson, chapter member, interviewed Colonel Lawton, Admiral Stone, General Ankenbrandt and other distinguished guests on the WBAL Television. At 7:15, Colonel Lawton's address to the chapter was carried over the NBC network. Due to studio accommodations, the audience was limited to 160. The broadcast was followed by a tour through the station and included both TV and standard broadcast facilities.

Cleveland

A tour of the facilities of the Acme Teletronix Division of the Newspaper Enterprise Association Service, Incorporated was the feature of the March 10th meeting of the Cleveland Chapter. The primary interest in this program was the preparation and handling of news and transmission of pictures by wire for newspapers.

Far East

The charter of the Tokyo Post of the Far East Chapter was presented by Brig. Gen. George I. Back, President of the Far East Chapter, at a meeting of the post on January 25th. A post constitution was adopted and officers were elected as follows: Chairman: Lt. Col. W. D. Dillinger; 1st Vice-Chairman: Col. R. S. Carter; 2nd Vice-Chairman: Chief W. A. Whaley;

Secretary: Maj. R. P. Zebley; Treasurer: Capt. I. Koss.

Kentucky

Chapter members met on February 18th at the Stirrup Cup in Lexington to commemorate the 86th anniversary of the founding of the Signal Corps. After the dinner, a Signal Corps birthday cake was cut in traditional style—with a saber—by the past president, Col. William M. Mack, assisted by the new president, Murray P. McQuown.

Lt. Col. Robert H. McAteer of the Military Department of the University of Kentucky addressed the group on the "Evolution and History of the Signal Corps." After Col. McAteer's talk, Mr. William Prewitt, a Lexington businessman and one of the members of Company B of the 113th Field Signal Battalion, which was organized in Lexington at the start of World War I, gave a very interesting and humorous sketch of the history of the 113th Field Signal Battalion.

The meeting closed with the showing of the film "Westward is Bataan."

New York

A concrete example of the real meaning of the unification of the Armed Services was presented to a joint meeting of the New York Chapter and the New York Volunteer Reserve Electronic Warfare Company on February 9th. The main meeting room of the historic Seventh Regiment Armory was filled to capacity with Army, Navy and Air Force, regular and reserve personnel, and representatives of the communications industry in New York.

After opening remarks by Chapter President George P. Dixon, Capt. Aubrey Wyckoff, USNR, was introduced as Commander of the Naval Reserve Unit participating. The chairman then introduced in turn Major General Spencer B. Akin, Chief Signal Officer of the Army; Rear Admiral Earl E. Stone, Chief of Naval Communications; and Major General Francis L. Ankenbrandt, Director of Air Force Communications; each of whom gave a short address concerning communications in his branch of the service. The talks by the communications chiefs were enthusiastically received. Following the meeting, dinner was served to the largest chapter turnout since the 1947 annual AFCA meeting held in New York.

Philadelphia

On March 3rd, the Philadelphia Chapter also celebrated the 86th anniversary of the Signal Corps at its

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dinner meeting at the Officers Club of the Philadelphia Quartermaster Depot. After introducing the distinguished guests, Chapter President W. W. Watts called on Col. Benjamin Stern, head of the Signal Corps Procurement Agency, who outlined the assistance which he believed AFCA could give to his activity. Brig. Gen. S. H. Sherrill, National Executive Director, spoke briefly on the activities of other chapters. Col. A. M. Shearer, Deputy Chief of Distribution and Procurement Service, OCSigO, was the principal speaker and outlined the history of the Signal Corps since it was founded in 1863 by Col. Myer.

Richmond

Members of the Richmond Chapter met on February 23rd at the Pantree in Richmond. Capt. E. L. Gibson, USAF, Langley Field Communications Center Officer for the Tactical Air Command, was the guest speaker. His subject was "Communications within the Tactical Air Command."

Southern California

The Southern California Chapter is now meeting regularly on the second Thursday of each month. The January 13th meeting was addressed by Col. Martin Shakeley, of the California National Guard, on the subject of ground defense against atomics. Col. Shakeley commands a brigade charged with the immediate organization of such measures as are feasible for controlling and supervising matters in the case of such an attack. He held a discussion period after his talk which the members felt was of immeasurable value.

The feature speaker for the February 10th meeting was Lt. Col. Ralph A. Pender, who commanded the First Combat Camera Unit with the 15th Air Force and MAAF during the past war. Col. Pender showed pictures made by his units of the air attacks on Ploesti and discussed problems of aerial photography of this nature. -50-

VWOA AWARDS CITATIONS

FOUR citations were awarded by the Veteran Wireless Operators Association, Inc., at the 24th annual dinner-cruise February 26. At the Hotel Astor in New York, radio officers A. T. Newberg "SS Gulfstream," Clarence H. Scruggs, United Fruit Steamer "Junior," and Arthur E. Murray, Bull Steamship Co. "Suzanne" were cited in recognition of meritorious service and excellence in radiotelegraph operation aboard their vessels while assisting in the rescue of the crew of the cutter "Eastwind," after it had collided with the oil tanker "Gulfstream" on January 19, 1949.

A citation was also presented to Mr. Raoul E. Cowden of the "SS Mormacrey" for meritorious service during the distress of the British tanker "Adellen" early in January. Mr. Cowden was highly commended for service beyond the call of duty when he remained on watch aboard ship for 72 hours, handling distress messages for the disabled vessel. -50-

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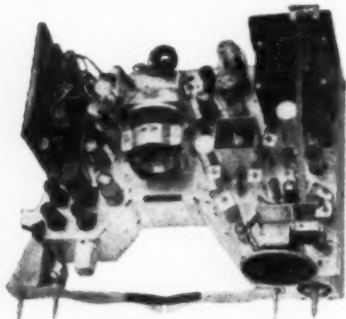
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1C6	\$.15	5W4	\$.15	6R7GT	\$.15	7B7	\$.12	12S7GT	\$.12	36	\$.36
1C7	\$.15	5X4G	\$.15	6S7	\$.15	7B8	\$.12	12S8GT	\$.12	36	\$.36
1D5GP	\$.15	5Y3GT	\$.15	6S8GT	\$.15	7C5	\$.12	12S9GT	\$.12	36	\$.36
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1E5GP	\$.15	5Z4	\$.15	6S8GT	\$.15	7C8	\$.12	12S9GT	\$.12	36	\$.36
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1G4	\$.15	6A7	\$.15	6S8GT	\$.15	7G7	\$.12	12S9GT	\$.12	36	\$.36
1G6GT	\$.15	6A8GT	\$.15	6S8GT	\$.15	7H7	\$.12	12S9GT	\$.12	36	\$.36
1H4G	\$.15	6A8GT	\$.15	6S8GT	\$.15	7J7	\$.12	12S9GT	\$.12	36	\$.36
1H5GT	\$.15	6A8GT	\$.15	6S8GT	\$.15	7L7	\$.12	12S9GT	\$.12	36	\$.36
1H6GT	\$.15	6A8GT	\$.15	6S8GT	\$.15	7M7	\$.12	12S9GT	\$.12	36	\$.36
1D5GP	\$.15	6A8GT	\$.15	6S8GT	\$.15	7N7	\$.12	12S9GT	\$.12	36	\$.36
1L4	\$.15	6A8GT	\$.15	6S8GT	\$.15	7Q7	\$.12	12S9GT	\$.12	36	\$.36
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1L4B	\$.15	6A8GT	\$.15	6S8GT	\$.15	7W7	\$.12	12S9GT	\$.12	36	\$.36
1L4C	\$.15	6A8GT	\$.15	6S8GT	\$.15	7X7	\$.12	12S9GT	\$.12	36	\$.36
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1L4F	\$.15	6A8GT	\$.15	6S8GT	\$.15	7Z4	\$.12	12S9GT	\$.12	36	\$.36
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1L4H	\$.15	6A8GT	\$.15	6S8GT	\$.15	12A	\$.12	12S9GT	\$.12	36	\$.36
1L4I	\$.15	6A8GT	\$.15	6S8GT	\$.15	12AB	\$.12	12S9GT	\$.12	36	\$.36
1L4J	\$.15	6A8GT	\$.15	6S8GT	\$.15	12AC	\$.12	12S9GT	\$.12	36	\$.36
1L4K	\$.15	6A8GT	\$.15	6S8GT	\$.15	12AD	\$.12	12S9GT	\$.12	36	\$.36
1L4L	\$.15	6A8GT	\$.15	6S8GT	\$.15	12AE	\$.12	12S9GT	\$.12	36	\$.36
1L4M	\$.15	6A8GT	\$.15	6S8GT	\$.15	12AF	\$.12	12S9GT	\$.12	36	\$.36
1L4N	\$.15	6A8GT	\$.15	6S8GT	\$.15	12AG	\$.12	12S9GT	\$.12	36	\$.36
1L4O	\$.15	6A8GT	\$.15	6S8GT	\$.15	12AH	\$.12	12S9GT	\$.12	36	\$.36
1L4P	\$.15	6A8GT	\$.15	6S8GT	\$.15	12AI	\$.12	12S9GT	\$.12	36	\$.36
1L4Q	\$.15	6A8GT	\$.15	6S8GT	\$.15	12AJ	\$.12	12S9GT	\$.12	36	\$.36
1L4R	\$.15	6A8GT	\$.15	6S8GT	\$.15	12AK	\$.12	12S9GT	\$.12	36	\$.36
1L4S	\$.15	6A8GT	\$.15	6S8GT	\$.15	12AL	\$.12	12S9GT	\$.12	36	\$.36
1L4T	\$.15	6A8GT	\$.15	6S8GT	\$.15	12AM	\$.12	12S9GT	\$.12	36	\$.36
1L4U	\$.15	6A8GT	\$.15	6S8GT	\$.15	12AN	\$.12	12S9GT	\$.12	36	\$.36
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1L4Z	\$.15	6A8GT	\$.15	6S8GT	\$.15	12AS	\$.12	12S9GT	\$.12	36	\$.36
1L5	\$.15	6A8GT	\$.15	6S8GT	\$.15	12AT	\$.12	12S9GT	\$.12	36	\$.36
1L6	\$.15	6A8GT	\$.15	6S8GT	\$.15	12AU	\$.12	12S9GT	\$.12	36	\$.36
1L7	\$.15	6A8GT	\$.15	6S8GT	\$.15	12AV	\$.12	12S9GT	\$.12	36	\$.36
1L8	\$.15	6A8GT	\$.15	6S8GT	\$.15	12AW	\$.12	12S9GT	\$.12	36	\$.36
1L9	\$.15	6A8GT	\$.15	6S8GT	\$.15	12AX	\$.12	12S9GT	\$.12	36	\$.36
1L10	\$.15	6A8GT	\$.15	6S8GT	\$.15	12AY	\$.12	12S9GT	\$.12	36	\$.36
1L11	\$.15	6A8GT	\$.15	6S8GT	\$.15	12AZ	\$.12	12S9GT	\$.12	36	\$.36
1L12	\$.15	6A8GT	\$.15	6S8GT	\$.15	12BA	\$.12	12S9GT	\$.12	36	\$.36
1L13	\$.15	6A8GT	\$.15	6S8GT	\$.15	12BB	\$.12	12S9GT	\$.12	36	\$.36
1L14	\$.15	6A8GT	\$.15	6S8GT	\$.15	12BC	\$.12	12S9GT	\$.12	36	\$.36
1L15	\$.15	6A8GT	\$.15	6S8GT	\$.15	12BD	\$.12	12S9GT	\$.12	36	\$.36
1L16	\$.15	6A8GT	\$.15	6S8GT	\$.15	12BE	\$.12	12S9GT	\$.12	36	\$.36
1L17	\$.15	6A8GT	\$.15	6S8GT	\$.15	12BF	\$.12	12S9GT	\$.12	36	\$.36
1L18	\$.15	6A8GT	\$.15	6S8GT	\$.15	12BG	\$.12	12S9GT	\$.12	36	\$.36
1L19	\$.15	6A8GT	\$.15	6S8GT	\$.15	12BH	\$.12	12S9GT	\$.12	36	\$.36
1L20	\$.15	6A8GT	\$.15	6S8GT	\$.15	12BI	\$.12	12S9GT	\$.12	36	\$.36
1L21	\$.15	6A8GT	\$.15	6S8GT	\$.15	12BJ	\$.12	12S9GT	\$.12	36	\$.36
1L22	\$.15	6A8GT	\$.15	6S8GT	\$.15	12BK	\$.12	12S9GT	\$.12	36	\$.36
1L23	\$.15	6A8GT	\$.15	6S8GT	\$.15	12BL	\$.12	12S9GT	\$.12	36	\$.36
1L24	\$.15	6A8GT	\$.15	6S8GT	\$.15	12BM	\$.12	12S9GT	\$.12	36	\$.36
1L25	\$.15	6A8GT	\$.15	6S8GT	\$.15	12BN	\$.12	12S9GT	\$.12	36	\$.36
1L26	\$.15	6A8GT	\$.15	6S8GT	\$.15	12BO	\$.12	12S9GT	\$.12	36	\$.36
1L27	\$.15	6A8GT	\$.15	6S8GT	\$.15	12BP	\$.12	12S9GT	\$.12	36	\$.36
1L28	\$.15	6A8GT	\$.15	6S8GT	\$.15	12BQ	\$.12	12S9GT	\$.12	36	\$.36
1L29	\$.15	6A8GT	\$.15	6S8GT	\$.15	12BR	\$.12	12S9GT	\$.12	36	\$.36
1L30	\$.15	6A8GT	\$.15	6S8GT	\$.15	12BS	\$.12	12S9GT	\$.12	36	\$.36
1L31	\$.15	6A8GT	\$.15	6S8GT	\$.15	12BT	\$.12	12S9GT	\$.12	36	\$.36
1L32	\$.15	6A8GT	\$.15	6S8GT	\$.15	12BU	\$.12	12S9GT	\$.12	36	\$.36
1L33	\$.15	6A8GT	\$.15	6S8GT	\$.15	12BV	\$.12	12S9GT	\$.12	36	\$.36
1L34	\$.15	6A8GT	\$.15	6S8GT	\$.15	12BW	\$.12	12S9GT	\$.12	36	\$.36
1L35	\$.15	6A8GT	\$.15	6S8GT	\$.15	12BX	\$.12	12S9GT	\$.12	36	\$.36
1L36	\$.15	6A8GT	\$.15	6S8GT	\$.15	12BY	\$.12	12S9GT	\$.12	36	\$.36
1L37	\$.15	6A8GT	\$.15	6S8GT	\$.15	12BZ	\$.12	12S9GT	\$.12	36	\$.36
1L38	\$.15	6A8GT	\$.15	6S8GT	\$.15	12CA	\$.12	12S9GT	\$.12	36	\$.36
1L39	\$.15	6A8GT	\$.15	6S8GT	\$.15	12CB	\$.12	12S9GT	\$.12	36	\$.36
1L40	\$.15	6A8GT	\$.15	6S8GT	\$.15	12CC	\$.12	12S9GT	\$.12	36	\$.36
1L41	\$.15	6A8GT	\$.15	6S8GT	\$.15	12CD	\$.12	12S9GT	\$.12	36	\$.36
1L42	\$.15	6A8GT	\$.15	6S8GT	\$.15	12CE	\$.12	12S9GT	\$.12	36	\$.36
1L43	\$.15	6A8GT	\$.15	6S8GT	\$.15	12CF	\$.12	12S9GT	\$.12	36	\$.36
1L44	\$.15	6A8GT	\$.15	6S8GT	\$.15	12CG	\$.12	12S9GT	\$.12	36	\$.36
1L45	\$.15	6A8GT	\$.15	6S8GT	\$.15	12CH	\$.12	12S9GT	\$.12	36	\$.36
1L46	\$.15	6A8GT	\$.15	6S8GT	\$.15	12CI	\$.12	12S9GT	\$.12	36	\$.36
1L47	\$.15	6A8GT	\$.15	6S8GT	\$.15	12CJ	\$.12	12S9GT	\$.12	36	\$.36
1L48	\$.15	6A8GT	\$.15	6S8GT	\$.15	12CK	\$.12	12S9GT	\$.12	36	\$.36
1L49	\$.15	6A8GT	\$.15	6S8GT	\$.15	12CL	\$.12	12S9GT	\$.12	36	\$.36
1L50	\$.15	6A8GT	\$.15	6S8GT	\$.15	12CM	\$.12	12S9GT	\$.12	36	\$.36
1L51	\$.15	6A8GT	\$.15	6S8GT	\$.15	12CN	\$.12	12S9GT	\$.12	36	\$.36
1L52	\$.15	6A8GT	\$.15	6S8GT	\$.15	12CO	\$.12	12S9GT	\$.12	36	\$.36
1L53	\$.15	6A8GT	\$.15	6S8GT	\$.15	12CP	\$.12	12S9GT	\$.12	36	\$.36
1L54	\$.15	6A8GT	\$.15	6S8GT	\$.15	12CQ	\$.12	12S9GT	\$.12	36	\$.36
1L55	\$.15	6A8GT	\$.15	6S8GT	\$.15	12CR	\$.12	12S9GT	\$.12	36	\$.36
1L56	\$.15	6A8GT	\$.15	6S8GT	\$.15	12CS	\$.12	12S9GT	\$.12	36	\$.36
1L57	\$.15	6A8GT	\$.15	6S8GT	\$.15	12CT	\$.12	12S9GT	\$.12	36	\$.36
1L58	\$.15	6A8GT	\$.15	6S8GT	\$.15	12CU	\$.12	12S9GT	\$.12	36	\$.36
1L59	\$.15	6A8GT	\$.15	6S8GT	\$.15	12CV	\$.12	12S9GT	\$.12	36	\$.36
1L60	\$.15	6A8GT	\$.15	6S8GT	\$.15	12CW	\$.12	12S9GT	\$.12	36	\$.36
1L61	\$.15	6A8GT	\$.15	6S8GT	\$.15	12CX	\$.12	12S9GT	\$.12	36	\$.36
1L62	\$.15	6A8GT	\$.15	6S8GT	\$.15	12CY	\$.12	12S9GT	\$.12	36	\$.36
1L63	\$.15	6A8GT	\$.15	6S8GT	\$.15	12CZ	\$.12	12S9GT	\$.12	36	\$.36
1L64	\$.15	6A8GT	\$.15	6S8GT	\$.15	12DA	\$.12	12S9GT	\$.12	36	\$.36
1L65	\$.15	6A8GT	\$.15	6S8GT	\$.15	12DB	\$.12	12S9GT	\$.12	36	\$.36
1L66	\$.15	6A8GT	\$.15	6S8GT	\$.15	12DC	\$.12	12S9GT	\$.12	36	\$.36
1L67	\$.15	6A8GT	\$.15	6S8GT	\$.15	12DD	\$.12	12S9GT	\$.12	36	\$.36
1L68	\$.15	6A8GT	\$.15	6S8GT	\$.15	12DE	\$.12	12S9GT	\$.12	36	\$.36
1L69	\$.15	6A8GT	\$.15	6S8GT	\$.15	12DF	\$.12	12S9GT	\$.12	36	\$.36
1L70	\$.15	6A8GT	\$.15	6S8GT							

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.00025 2500 V	.25
.00025 5000 V	.85
.0005 2500 V	.25
.00072 5000 V	.85
.0008 5000 V	.85
.001 2500 V	.25
.002 1000 V	.20
.002 3000 V	.65
.002 2500 V	.30
.003 3000 V	.65
.004 2500 V	.35
.005 1000 T.V.	.15
.005 3000 V	.65
.006 2000 V	.35
.008 1200 V	.15
.01 1000 T.V.	.15

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BT-1/2-8,200	1/2-5%	IRC	1.75 per 100
BT-1/2-10,000	1/2-10%	IRC	1.75 per 100
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BT-1/2-220,000	1/2-10%	IRC	1.75 per 100
BT-1/2-470,000	1/2-10%	IRC	2.25 per 100
BT-1-22,000	1-10%	IRC	2.25 per 100
BT-1-27,000	1-10%	IRC	2.25 per 100
BT-1-100,000	1-5%	IRC	2.25 per 100
BT-1-220,000	1-10%	IRC	2.00 per 100
BT-1-470,000	1-5%	IRC	2.25 per 100
BW-2-22	2-10%	IRC	2.50 per 100
BW-2-56	2-10%	IRC	2.50 per 100
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BT-2-22,000	2-10%	IRC	2.50 per 100
BT-2-27,000	2-10%	IRC	2.50 per 100
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PEORIA "HAMS" HOLD PICNIC

H. C. SEVER, acting secretary of the Peoria Amateur Radio Association, announces that it will hold its "Annual Hamfest" on June 12, 1949, at Woodland Knolls, which is located approximately 4½ miles east of McCluggage Bridge, near Peoria.

The members will bring their own basket lunches, but arrangements have been made for contests, sporting events, and lots of other entertainment. The Peoria ARA hopes to have a large turnout and has appointed H. E. Callander, 211 E. McClure, Peoria, Illinois, to answer all inquiries of those interested in joining the festivities.

TV SET PRODUCTION

DESPITE a shortage of cathode-ray tubes, which retarded production in some instances, February television receiver output was approximately at the same level as January, the Radio Manufacturers Association reported today. TV receivers produced by RMA member-companies in February numbered 118,938, slightly below the 121,238 sets manufactured in January.

Coincident with the decrease in all set production, the number of FM-AM and FM receivers produced in February dropped to 98,969 from 147,733 in January. Adding our usual 10 per-cent for non-RMA members will bring the total of television sets produced in January and February to approximately 133,362 and 130,832, respectively.

ERRATUM

Footnote¹ on page 62, April issue, is in reference to the Cataldo & Richard article entitled "Servicing Simplified," published in the January, 1949, issue of RADIO AND TELEVISION NEWS.

PHOTO CREDITS

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35, 36, 37	Don Lee Mutual
47, 70	Radio Corporation of America
48, 49 (Fig. 9)	Philco Corporation
49 (Figs. 7 & 8)	North American Philips Co., Inc.
50	Acme
53 (Top)	Flexible Co.
53 (Bottom)	Oklahoman and Times
60, 61	McMurdo Silver Co., Inc.
64	(Left) The Hallcrafters Co. (Center) Sentinel Radio Corp. (Right) Tele-Tone Radio Corp.
68, 69	Burton Browne Advertising
138	U. S. Army
146	U. S. Navy
147	Sun Radio & Electronics Co., Inc.

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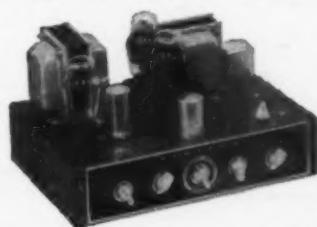
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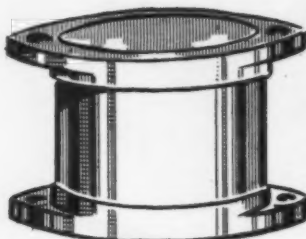
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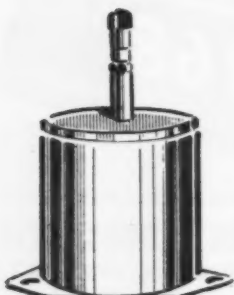
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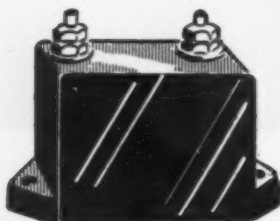
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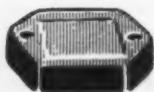
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STYLE "A"



STYLE "B"



STYLE "C"



STYLE "D"

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.02	3000	2	\$4.50	.024	1500	3	1.60	.02	600	7	.35
.04	1000	2, 7	3.50	.033	1500	3, 7	1.60	.02	1200	7	.45
STYLE "A" CONDENSERS				.056	1000	3, 7	1.70	.022	1200	7	.45
25mmfd	10000	8	\$1.65	.06	1000	8	1.70	.025	600	8	.35
STYLE "B" CONDENSERS				.1	1000	8	1.75	.03	600	6	.35
.00003	2000	2	\$0.70	STYLE "C" CONDENSERS				.03	1200	2, 8	.50
.000047	3000	1	.80	.000005	2500	2	\$0.40	.033	600	7	.35
.00005	3000	2, 9	.75	.00005	600	7, 8	.30	.033	1200	8	.50
.00007	1140	6	.70	.0001	600	2, 7	.25	.04	600	7, 8	.35
.00009	3000	2, 7, 9	.75	.0001	1200	7	.35	.073	250	8	.40
.000091	3000	7	.80	.0001	2500	4, 7, 8	.40	STYLE "D" CONDENSERS			
.0001	3000	2, 7, 9	.80	.0002	600	2, 7, 9	.25	.00004	600	7	\$0.20
.000107	3500	1	.85	.0002	2500	7	.40	.00005	1200	1, 7, 9	.25
.00011	3000	8	.95	.00024	2500	7, 8	.45	.00005	2500	2, 8, 9	.30
.000137	3000	2	.95	.00025	2500	2	.45	.0001	600	9	.20
.000175	1500	8	1.00	.0003	2500	7	.45	.0001	1200	7, 8	.25
.0002	1430	6	1.00	.00039	2500	7	.50	.00015	2500	2, 6	.35
.0002	3000	7, 8	1.00	.0004	2500	2, 7, 9	.45	.00024	2500	6	.35
.0002	5000	1, 8	1.05	.0005	600	1, 7	.40	.00025	1200	6, 8	.35
.00025	5000	7	1.10	.0005	1200	2, 7	.45	.00025	2500	6, 8	.35
.0004	3000	2, 7	.95	.0005	2500	1, 2	.45	.0005	1200	7	.30
.0004	5000	2, 7, 8	1.10	.001	1200	2, 7, 8	.40	.00051	2500	1	.35
.0004	6000	1	1.55	.001	2500	6, 7	.55	.0007	600	2	.25
.0005	2000	7	.95	.001	3750	7	.85	.001	600	2, 8	.25
.0005	3000	3	1.00	.0011	600	2	.35	.001	1200	6, 8, 9	.30
.00051	3000	7	1.00	.002	600	7	.35	.001	2500	6, 8	.40
.00055	3000	7	1.10	.002	1200	2	.45	.0011	2500	8	.40
.0006	2500	7	1.05	.002	2500	1, 2, 8	.55	.002	600	1, 2, 9	.25
.000625	5000	8	1.15	.002	3500	8	.80	.002	1000	8	.30
.0007	3000	7	1.05	.0022	2500	7	.60	.002	1200	6, 7, 8	.35
.00075	2500	2	1.05	.003	600	8	.40	.002	1250	1	.35
.00075	5000	8, 9	1.15	.0035	2500	7, 9	.60	.002	2500	8	.40
.0008	3000	7	1.00	.0039	2500	2	.60	.0022	1200	8, 7	.30
.0008	5000	2, 8	1.15	.004	2500	2, 7	.60	.0022	2500	8	.40
.001	4500	2, 9	1.25	.0045	600	8	.45	.0025	600	2	.25
.001	5000	7, 8	1.30	.0046	500	9	.40	.0025	1200	1	.30
.0011	5000	2, 7	1.35	.0047	2500	8	.65	.0027	600	1	.25
.00125	2000	7	1.10	.005	600	2	.35	.003	600	2	.25
.0014	5000	2	1.35	.005	1200	7, 8	.45	.003	1200	6, 7, 8	.30
.0015	3000	7	1.10	.005	2500	7, 8	.60	.0033	1200	6	.30
.0024	3000	8	1.15	.0051	1200	7	.45	.004	1100	8	.35
.0025	2000	1, 2, 7	1.10	.0051	2500	7, 8	.65	.004	1200	7, 8	.35
.00275	2000	1, 7	1.10	.0056	2500	8	.65	.004	2500	9	.45
.003	2000	7	1.20	.006	600	7, 9	.40	.0044	600	8	.25
.004	3000	2, 8	1.50	.006	2500	7	.65	.0047	2500	6, 8	.40
.005	2000	2	1.40	.0068	1200	7	.60	.005	600	2, 6, 7	.25
.005	5000	6, 8	1.70	.007	600	8	.35	.006	600	1, 2	.25
.006	2500	7	1.30	.0075	1200	2	.55	.01	600	2, 7, 8	.30
.006	3500	8	1.45	.009	600	9	.50	.01	1200	6, 7, 8	.40
.0068	3000	8	1.40	.01	600	2, 7, 8	.40	.01	1250	1, 6, 9	.40
.008	3000	7, 8	1.45	.01	1200	3, 7, 8	.45	.01	2500	2, 8	.50
.01	2000	1, 2, 3	1.55	.0115	2500	7, 8	.60	.02	600	2, 6, 8	.25
.01	1000	7	1.35	.013	600	8	.40	.022	600	7	.25
.02	600	7	1.30	.015	1200	3	.55	.025	1200	7	.35
				.015	2000	7	.55	.027	600	7	.25
				.015	2500	7, 8	.60	.03	600	2, 8	.25
								.05	600	7	.30

Manufacturers' Legend

1—Aerovox; 2—Cornell Dubilier; 3—Faradon; 4—General Electric; 5—Illinois; 6—Mica-Mold; 7—Sangamo; 8—Solar; 9—Sprague

This is only a partial listing. Write or wire for information on types not shown and for receiving set micas and silver micas.

We advise distributors to order immediately from this ad. Our standard jobber arrangement applies.

Manufacturers and Distributors: Write for our complete Mica Condenser Listing No. 103A.

WELLS
SALES, INC.

320 N. LA SALLE ST., DEPT. R-5, CHICAGO 10, ILL.